Bibliographie

Franco P. Preparata, Michael Ian Shamos, Computational Geometry, An introduction (Texts an Monographs in Computer Science) XIII+390, Springer-Verlag, 1985

"The objective of this book is a unified exposition of the wealth of results that have appeared-mostly in the past decade — in Computational Geometry. This young discipline — so christened in its current connotation by one of us, M. I. Shamos — has attracted enormous research interest, and has grown from a collection of scattered results to a mature body of knowledge. This achieved maturity, however, does not prevent computational geometry from being a continuing source of problems and scientific interest."

The book is divided into eight chapters.

Chapter 1 starts with a short historical survey and contains the necessary concepts of the geometry of convex sets, metric and combinatorial geometry, the theory of algorithms, complexity theory and data structures. Some special data structures are introduced, such as the segment tree and the doubly-connected-edge-list. Here can be found the famous Ben-Or theorem about the depth of an algebraic decision tree that solves the membership problem in a subset of E^n. This theorem will be the basic tool for proving lower bound results.

Chapter 2 develops the basic methods of geometric searching that will be used in the succeeding chapters to solve rather formidable problems. Two types of questions are considered. The first one is to determine whether a given point is internal to a simple or a convex polygon. These questions can be answered in $O(N)$ time (for an N-gon) without preprocessing, but in $O(\log N)$ time if given $O(N)$ space and $O(N)$ preprocessing time. The generalization of this problem is to locate a point in a planar subdivision generated by a planar straight-line graph. There are several efficient algorithms for this question, such as the planar-separator method and the triangulation method.

The second class of problems is the range searching problems, which may be viewed as dual, in some sense, of the previously discussed point-location problems. Some quite interesting and clever methods are illustrated for these problems.

Chapter 3 deals with one of the central questions of computational geometry: the determination of convex hull. Ben-Or's result is applied to give a lower bound $\Omega(N \log N)$ and then optimal algorithms are considered in two dimension, such as Graham's scan, Jarvis's march, divide-and-conquer and dynamic algorithms. For the more complicated higher-dimensional cases the gift-wrapping and beneath-beyond methods are presented with complexity $O(N^{\lfloor d/2 \rfloor + 1})$. However, very surprisingly, in the most important three-dimensional case the problem can be solved in optimal time $O(N \log N)$.

Chapter 4 is devoted to the discussion of extensions and applications of the convex hull algorithms. The average case analysis of Jarvis's algorithm gives the $O(N)$ expected time, and an approximation algorithm for convex hull is presented which is quite efficient for statistical problems. The remaining part of the chapter deals with the applications. Their variety should convince the reader that the hull problem is important both in practice and as a fundamental tool in computational geometry.

Chapter 5 is concerned with proximaty problems: closest pair, all nearest neighbors, euclidean spanning tree, triangulation. After proving the $\Omega(N \log N)$ lower bound for these problems a divide-and-conquer scheme is presented to solve the closest pair problem in $O(N \log N)$ time. The main

objective of this chapter is to develop the quite fruitful concept of the Voronoi diagram, which contains all of the proximity information defined by the given set. The algorithmic construction of the Voronoi diagram is given and is then applied to obtain optimal algorithms for the first two of the above — mentioned problemes.

In Chapter 6, continuing the discusson of the Voronoi diagram, an afficient triangulation method is presented and this gives optimal algorithms for the euclidean spanning tree problem and approximate solutions for the euclidean travelling salesmen and euclidean matching problems. In the remaining part several generalizations of the Voronoi diagram are obtained and further applications can be found.

Chapter 7 starts the study of intersection problems by selecting some applications from various fields to motivate these questions. These are the hidden-line and hidden-surface problems, pattern recognition, wire and component layout and linear programming. Efficient algorithms are given for the intersection of convex polygons, star-shaped polygons and line segments in the planar case, while the intersection of convex polyhedra in three dimensions can be determined by a good algorithm, although it is not known whether it is optimal or not.

Chapter 8 is denoted to the study of the geometry of rectangles, which has not only theorethical interest but is the fundamental ingredient of a number of applications, such as Very—Large—Scale—Integration and concurrency controls in data-bases. Using the results of the previous chapters, efficient algorithms are given to determine the measure perimeter, contour, closure and external contour of a union of rectangles and intersections of rectangles.

The book is written in a nice style. Each section is followed by additional notes and comments and a collection of interesting exercises. At the end of the book, very good up-to-date references can be found.

This excellent book is recommended to mathematicians intending to specialize in computationa geometry, and also to non-specialists who are interested in the recent advances in computational geometry.

J. KINCSES

J. P. Tremblay, P. G. Sorenson: The theory and practice of compiler writing XIX + 796 pages, McGraw-Hill Book Company, 1985.

The book deals with all aspects of compiler writing, mainly from a practical point of view. The reader familiar with basic notions of programming languages and grammars can use the chapters independently as a reference book in designing compiler modules. In the discussion of the different technics, after a short overview of motivation and the theoretical background, the algorithms are given in full detail textually. The language used to formulate the algorithms is easy to read. Numerous exercises serve the self-study in compiler design. Each chapter contains an appropriate bibliography.

The main chapters are: programming language design (with an overview of ADA as an example); scanners (regular grammars and finite-state acceptors); top-down parsing (SLL(1), LL(1) parsers); bottom-up parsing (operator precedence, simple precedence grammars, LR(0), SLR(1), LALR(1), LR(1) parsers); compile-time error handling; symbol-table handling; sum-time storage organization; semantic analysis; code generation and optimization; compiler-compilers.

Á. MAKAY

William A. Foley, Robert D. Van Valin, Jr.: Functional Syntax and Universal Grammar. Cambridge University Press, 1984. 416 p.

This book is the result of an effort to develop a grammar which is based on the function of language. As the title suggests, the authors have made an attempt to construct a theory of syntax which is wide enough to cover linguistic phenomena in a great number of languages.

The approach represents a combination of analysis from different levels: the authors view language in function not as a *set of isolated simple sentences*, but rather as a piece of discourse constituted by *complex expressions*. These expressions are made up of a number of clauses linked together in various ways. This linkage is chosen as the starting-point for the integration of linguistic phenomena from different levels. Thus, the main concern of this book is the investigation of the relationship of "clause-internal morhosyntax to clause linkage and cross-caluse reference-tracking mechanisms". The authors argue that the morphosyntactical analysis of the clause must proceed from an interclausal and ultimately discourse perspective.

The investigation of discourse function in carried out within the theory of Role and Reference Grammar (RRG), which W. Foley and R. Van Valin have been developing since the publication of its preliminary sketch in 1980.

If the evolution of linguistics is marked by the antagonism of formalism and functionalism, then it is the latter school of thought to which this monograph adheres. And if we view formalism as an orientation based on the assumption that language is a potentially infinite set of structural descriptions of sentences, then functionalism must be assumed to deal with language in relation to its role in human communication. This is the theoretical distinction which is made clear in Chapter 1.

The remaining six chapters are devoted to an exploration of the means which languages use to code participants and situations in (narrative) discourse, particularly the tracking of participants across clause sequences.

Chapter 2 is concerned with predicate semantics, and Chapter 3 deals with case marking following Silverstein's basic assumptions. Chapter 4 is a presentation of passivization and antipassivization, whereas Chapter 5 goes beyond the confines of clause-internal syntax, discussing a number of issues pertaining to complex sentences. Chapter 6 is an extension of the investigation into clause linkage with a discussion of *nexus*, a term referring to the relations that hold between clauses in complex sentences. Chapter 7 is an analysis of reference-tracking in discourse.

It should be noted that functionalism as an orientation alongside and, to some extent, against linguistic formalism represented by such outstanding theoreticians as N. Chomsky or R. Montague, has attracted much attention for the past two or three years. This is probably due to an ever-growing interest in discourse analysis, which has now become an integral part of present day functional grammars, as evidenced both by the book at hand and by M. A. K. Halliday's recent monograph. If the latter is an introduction to functional grammar based on English, then Functional Syntax and Universal Grammar is a book with a rich illustrative material from a wide variety of languages.

It is the reviewer's contention that all those interested in the theory and use of language will find this book valuable and stimulating.

I. BÉKÉSI

M. Berger: Computer graphics with Pascal. XVII+347 pages, The Benjamin/Cummings Pubishing Company, Inc. 1986.

The book is published in the Benjamin/Cummings Series in Computing and Information Sciences.

"The text begins with a description of the history and applications of computer graphics which is followed by an introduction to the hardware and software components of a graphics system. Included are hardcopy output and input devices, CRT technology, raster-scan and random-vector systems, the display processor, and scan conversion. In Chapter 2 the student begins to draw images using the screen coordinates. The difficulties in drawing basic figures such as lines and circles are explored. The next chapter introduces the reader to the worlds coordinate system and the viewing transformation. Chapter 4 uses the concepts presented in the previous chapter to create business and artistic graphics.

Chapter 5 describes the fundamentals of two-dimensional geometric transformations. Chapter 6 implements the concept of display file segmentation.

Chapter 7 examines the requirements of a user-friendly graphics program. After an initial discussion of the problems inherent in running graphics programs on a minicomputer, the reader is led through a detailed decription of error-handling and menu-generating routines. Chapter 8 treats interactive techniques, while Chapter 9 extends these concepts to animation.

Chapter 10 provides frame buffer and scan conversion algorithms for polygon and area filling. Chapter 11 introduces the coordinate systems and transformations needed for three-dimensional viewing. Chapter 12 describes the generation of realistic images using curves and surfaces, and Chapter 13 extends this realism by implementing hidden-surface removal.

The appendix describes the fundamental features of the two-dimensional graphics standard GKS."

This very clearly written book can be recommended as a text for an introductory course in computer graphics.

J. CSIRIK

G. Reinelt: The Linear Ordering Problem: Algorithms and Applications. XI + 158 pages, Heldermann Verlag Berlin, 1985. (Research and exposition in mathematics; Vol. 8)

The book gives a new algorithm for the linear ordering problem. This problem may be formulated as follows:

"We are given the complete digraph $D_n=(V_n, A_n)$ on n nodes and arc weights C_{ij} for each arc $(i,j)\in A_n$. The linear ordering problem now consists in finding a spanning acyclic tournament in D_n such that the sum of the weights of its arcs is as large as possible. This problem is interesting from a theoretical point of view, and moreover, it has several practical applications in economics, scheduling, sports, and social sciences. In this treatise we solve a number of real-world problems of this type.

In Chapter 1 some basic mathematical definitions and results from graph theory, polyhedral theory and computational complexity theory are surveyed. This introduction is not meant to be comprehensive but is intended to provide the reader with the basic concepts and notations. In Chapter 2 the linear ordering polytope P^n_{LO} is defined, various classes of facet defining inequalities for this polytope are derived, and in addition some remarks concerning adjacency and diameter are made. The chapter ends with the partial description of P^n_{LO} by a set of nonredundant inequalities and equations. This theoretical investigation is a central part of this monograph and lays the foundation of an algorithm for the solution of linear ordering problems whichis discussed in Chapter 3. The computational results of the algorithm when applied to the so-called triangulation problem for input-output tables are reported in Chapter 4. Statistical data such as computing times, number of generated cutting planes or sizes of the linear programs involved are given, the optimization process is illustrated and several cutting plane generation strategies are compared. Since the triangulation problem for input-output tables is an important one in economics (there is a great variety of publications dealing with this problem) we discuss several aspects of it in Chapter 5. We focus attention on how knowledge of "true" optimum solutions can influence or refine previous interpretations and applications made in the literature which were often based on suboptimal solutions. A review of previous algorithms and approaches to the solution of the linear ordering problem is given in Chapter 6. Some more examples of applications of the linear ordering problem are considered in Chapter 7 and complete this tract."

The book is self-contained, and the material is well-arranged. The book can be recommended to everyone interested in combinatorial optimization problems.

J. CSIRIK

The Carnegie-Mellon Curriculum for Undergraduate Computer Science (Edited by Mary Shaw) X + 198 pages, Springer-Verlag, New York Berlin Heidelberg Tokyo, 1985

"This book is a result of a three-year effort by the Carnegie-Mellon Computer Science Department to develop a unified undergraduate computer science curriculum. The study, conducted by an eight-member Curriculum Design Group, responds to this rapidly changing field by emphasizing a balanced blend of fundamental conceptual material which the student can adapt to new situations, with examples drawn from the current practice. This integration of theory and practice is a theme of virtually every course described, recognizing that students must be able to use their theoretical knowledge to generate cost-effective solutions to real problems. This comprehensive redesign of the traditional curriculum reflects the structure of modern computer science. As a result, concepts traditionally distributed over several courses often form the basis for new courses. The book outlines 30 computer science courses along with requirements for an udergraduate major based on this curriculum."

The book is warmly recommended to people dealing with computer science education.

GY. HORVÁTH