spline bases whose knot sequences are not necessarily monotone increasing, but are instead "progressive," a property defined to include monotone sequences but having some important nonmonotone examples as well.

The chapters contributed by Lyche and Mørken are selective, organized, and polished. The chapters contributed by Barry and Goldman are a flood of information, shy on the distinction between central results and peripheral material. The chapter by Banks, Cohen, and Mueller provides an example application of knot adjustment in the setting of computer-aided design. The book is a worthwhile reference.

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30[42-02, 42C99, 94A12].—YVES MEYER, *Wavelets: Algorithms & Applications* (translated and revised by Robert D. Ryan), SIAM, Philadelphia, PA, 1993, xii+133 pp., 25 cm. Price: Softcover $19.50.

This is an important book on wavelet analysis and its applications, written by one of the pioneers in the field. It is based on a series of lectures given in 1991 at the Spanish Institute in Madrid. The text was revised and translated in admirable fashion by Robert D. Ryan. The book presents recent research on wavelets as well as extensive historical commentary. The mathematical foundations of wavelet theory are dealt with at length, but not to the exclusion of relevant applications. Signal processing is especially emphasized, it being viewed here as the source from which wavelet theory arises. The text is well written in a clear, vivid style that will be appealing to mathematicians and engineers.

The first chapter gives an outline of wavelet analysis, a review of signal processing, and a good glimpse of the contents of subsequent chapters. Chapter 2 sketches the development of wavelet analysis (which can be traced back to Haar and even to Fourier). Here we find explanations of time-scale algorithms and time-frequency algorithms, and their interconnections. Chapter 3 begins with remarks about Galand's work on quadrature mirror filters, which was motivated by the possibility of improving techniques for coding sampled speech. The author then leads us to the point where wavelet analysis naturally enters, and continues to an important result on convergence of wavelets and an outline of the construction of a new "special function"—the Daubechies wavelet. Further discussion of time-scale analysis occupies Chapter 4. In this chapter the author uses the pyramid algorithms of Burt and Adelson in image processing to introduce the fundamental idea of representing an image by a graph-theoretic tree. This provides a background for some of the main issues of wavelet analysis, such as multiresolution analysis and the orthogonal and bi-orthogonal wavelets, that are the main topics of this chapter. From Chapters 3 and 4 readers can see how quadrature mirror filters, pyramid algorithms, and orthonormal bases are all miraculously interconnected by Mallat's multiresolution analysis.

Chapters 5 through 7 are devoted mainly to time-frequency analysis. In Chapter 5, Gabor time-frequency atoms and Wigner-Ville transforms are viewed from the perspective of wavelet analysis. Not only is this of independent interest, but it also motivates the next two chapters as well. Chapter 6 discusses Malvar wavelets, especially the modification due to Coifman and Meyer that allows the wavelets to have windows of variable lengths. An adaptive algorithm for finding the optimal Malvar basis is then described. Chapter 7 concentrates on wavelet packets and splitting algorithms. These algorithms are useful in choosing an optimal basis formed by wavelet packets. Borrowing the words of Ville (1947), the author emphasizes the following points in Chapters 6 and 7: In the approach of Malvar's wavelets, we "cut the signal into slices (in time) with a switch; then pass these different slices through a system of filters to analyze them." In the approach of wavelet packets, we "first filter different frequency bands; then cut these bands into slices (in time) to study their energy variations."

The last four chapters introduce some fascinating and promising applications of wavelets. The first of these is Marr's analysis of the processing of luminous information by retinal cells. In particular, Marr's conjecture and a more precise version of it due to Mallat are discussed. Marr's conjecture concerns the reconstruction of a two-dimensional image from zero-crossings of a function obtained by properly filtering the image. In Chapter 9 it is shown that, for some signals, wavelet analysis can reveal a multifractal structure that is not disclosed by Fourier analysis. To this end, two famous examples, the Weierstrass and Riemann functions (which show that a continuous function need not have a derivative anywhere), are examined from the viewpoint of wavelet theory. Chapters 10 and 11 describe how wavelets can shed new light on the multifractal structure of turbulence and on the hierarchical organization of distant galaxies.

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31[41-01, 41A15, 41A63, 68U07].—J. J. Risler, *Mathematical Methods for CAD*, Cambridge Univ. Press, Cambridge, 1992, 196 pp., $23\frac{1}{2}$ cm. Price \$69.95.

This is a welcome addition to the literature, providing in very readable and efficient form the mathematical underpinnings of Computer-Aided-Design (CAD). A summary of the chapters follows.

Chapter 1 concerns the B-splines, including the case of multiple knots. Variation-diminishing properties, the Schoenberg operator, and the Hermite-Genochi formula are all discussed. In Chapter 2, Bernstein polynomials and Bézier curves are introduced; they are formulated in terms of B-splines. Knot insertion and subdivision algorithms (such as the "Oslo" algorithm) are given. Chapter 3 is devoted to interpolation of functions from $\mathbb{R}$ to $\mathbb{R}^s$, in other words, finding curves passing through specified points in $\mathbb{R}^s$. This task is performed with B-splines and rational spline curves. In Chapter 4, surfaces make their appearance, approximated first by tensor products of splines. Here are Coon's patches and Boolean sums of operators. Triangular patches are then taken up at length. The B-splines are generalized to s dimensions as "polyhedral splines". Box splines are a special case. Chapter 5 is on triangulations and algorithms for obtaining them, such as the Voronoï-Delaunay method. Optimality and complexity questions are addressed. Much of the discussion is valid for arbitrary