Knihy došlé do redakce (Books received)

Simulationstechnik — Proceedings 3. Symposium Simulationstechnik Bad Münster a. St.-Ebernburg, September 1985 (*Dietmar P. F. Möller, ed.*). (Informatik-Fachberichte 109.) Springer-Verlag, Berlin—Heidelberg—New York—Tokyo 1985. XIV + 539 pages; DM 62,—.

Andrej Pázman: Foundations of Optimum Experimental Design. (Mathematics and Its Applications — East European Series. Translation of: Základy optimalizácie experimentu, Veda, Bratislava 1980.) VEDA, Bratislava 1986 in co-edition with D. Reidel Publishing Company, Dordrecht, Holland. XVI + 228 pages; Kčs 23,—.

Karel Rektorys: Metoda časové diskretizace a parciální diferenciální rovnice. (Teoretická knižnice inženýra.) SNTL - Nakladatelství technické literatury, Praha 1985. 364 stran; 13 obr., 6 tab.; Kčs 50,—.

Information Technology Research and Development — Critical Trends and Issues (Office of Technology Assessment, Congress of the United States). Pergamon Press, New York—Oxford—Toronto—Sydney—Frankfurt 1985. xvi + 344 pages; $ 75.00.

Gerhard Reinelt: The Linear Ordering Problem: Algorithms and Applications. (Research and Exposition in Mathematics 8.) Heldermann Verlag, Berlin 1985. xi + 160 pages; DM 38,—.

LI WEIXUAN

Optimal Sequential Block Search

Research and Exposition in Mathematics 5.
Heldermann Verlag, Berlin 1984.
210 pages; DM 38,—.

The book under review is dedicated to the problem of finding an optimal value of an unimodal function defined on a given inetrval. (A function $f(x)$ is said to be *unimodal* on an interval $[a, b]$ if there is a point $x^* \in [a, b]$, called the *optimal point*, such that $x_1 < x_2 \leqq x^*$ or $x^* \leqq x_2 < x_1 \Rightarrow f(x_1) < f(x_2)$.) It is supposed that the analytic expression of this function is either unknown or so complicated that no analytic method can be used. Thus, the only thing what can be done is to select some points in the interval in question, evaluate the functional values at these points and accept the best one among them as an approximation of the optimal point. A strategy, how these points are successively selected to reach an approximation of the optimal point, is called a *sequential search.* If several evaluations of the unimodal function is performed at each step then the procedure is called a *sequential blok search.*

A (finite or infinite) sequence of positive integers $K = (k_1, k_2, \ldots)$ is supposed to be given. Then, a sequential block search described by a *K-strategy* performs k_i experiments at the ith step and the K-strategy is nothing else than a mapping appointing how to choose the experimental points at each step. The choice is dependent on the results of preceding steps. Having $N = k_1 + k_2 + \ldots + k_n$ values of the given unimodal function f evaluated in the first n steps one can see that there exists one point x_m such that

$$f(x_1) < f(x_2) < \ldots < f(x_m) \geqq f(x_{m+1}) > \ldots \ldots > f(x_N)$$

if $x_1 < x_2 < \ldots < x_m < \ldots < x_N$. The point x_m is the *approximation* and $[x_{m-1}, x_{m+1}]$ the *remaining interval* obtained in the nth step. It is clear that at further looking for a better approximation one can choose next points from the remaining interval only. On the other hand, when finishing the process after the nth step the length of the remaining interval $[x_{m-1}, x_{m+1}]$ expresses an accuracy of the approximation. The *accuracy of order n* (or briefly *n-accuracy*) of a K-strategy s, denoted by $D_n(s)$, is defined to be the maximum length of the remaining intervals considering all possible unimodal functions.

From the practical point of view, the distance of two adjacent points selected is considered because if two experiments are performed too closely to each other their results cannot be distinguished. Therefore, the *resolution* of a strategy s, denoted by $\delta(s)$, is defined to be the minimum distance of two selected points. A K-strategy with the resolution δ is called a (K, δ)-*strategy*.

Given an interval $[a, b]$, a sequence $K = (k_1, \ldots, k_n)$ and a positive δ the goal is to find a (K, δ)-strategy with the smallest possible n-accuracy. Or, equivalently, for a given K, $\delta > 0$ and a positive number D one may try to look for a (K, δ)-strategy with n-accuracy D which has a search interval $[a, b]$ of length as great as possible. So, following the latter case, a strategy s with n-accuracy equal to 1 is said to be *normalized* and the length of its search interval is denoted by $I(s)$. A normalized (K, δ)-strategy s_0 is is said to be *optimal* if for any normalized (K, δ)-strategy s $I(s_0) \geqq I(s)$. The optimal (K, δ)-strategy is described in Chapter II of the book where also the proof of its optimality is given.

Chapters III and IV present a complete solution of the *Optimal Block Search Problem* which consists in the following: Given integers N and n $(N > n > 1)$ and a real number δ $(0 \leqq \delta \leqq {}^1/_2)$ find a sequence $K = (k_1, \ldots, k_n)$ such that $k_1 + \ldots + k_n = N$ and the respective optimal (K, δ)-strategy has the largest search interval.

Chapter V studies strategies of infinite order which correspond to situations when the number of steps is not known in advance. The last two chapters deal with a modification of the problem which is, according to the author, relatively unexplored. It consists in considering a *time delay*. The modification describes situations when one has to wait for the results of experiments so that several evaluations (one by one) have to be performed before the result of the first experiment becomes known.

Since the only prerequisite for this book is preliminary matrix theory the author suceeded in presenting a comprehensive account of this topic for both students and researchers in mathematics, operations research and engineering. The book sums up results largerly by Chinese authors which appear for the first time in English language.

Radim Jiroušek