Richard E. Bellman, Stuart E. Dreifus: PROGRAMAREA DINAMICĂ APLICATĂ

(A Romanian translation of the "Applied Dynamic Programming")

Editura Tehnică, Bucureşti, 1967, 440 pp.

Dynamic programming is a new method based on the use of functional equations and on the optimizing principle, having in view the use of electronic computers.

Bellman and Dreyfus' book shows the manner in which dynamic programming can be used to solve laborious optimizing and variational problems, referring particularly to the practical applications of the latter.

The work comprises 12 chapters each accompanied by commentaries and references.

Thus, the aim of Chapter I is to introduce the reader to the methodology of dynamic programming, including both theoretical aspects and those connected with actual computation. Chapter II deals with a variety of complex problems which spring up when a realistic description of economic processes is initiated. It is shown that the method of successive approximations and the method of continuity can be used in solving allocation economic problems. In Chapter III a few processes in the domain of planning are studied, several analytic and computation solutions being presented. Chapter IV deals with some aspects in the solving of dynamic programming problems by means of electronic computers. A characteristic fact in this respect is that the computed solution of the dynamic programming processes raises, in its turn, new problems of dynamic programming. In Chapter V the basic notions of variational computation are presented, the difficulties arising in the machine solution of the computation being shown. Chapter VI deals with an interesting application of dynamic programming, viz. the determination of optimum trajectories. Specific problems are discussed and their numerical solutions are given. Chapter VII deals with problems in the domain of mathematical economy. A few of the associations between the results presented in the book and Neumann's macroeconomic theory are briefly shown in connection with the theory of games and linear programming.

In the following chapters, VIII and IX, a series of dynamic programming applications to control processes with feedback and to similar processes are discussed. The identifying and formulating of the problems is discussed and some numerical results obtained on the computer are presented. Besides the problems related to the control processes with feedback, a problem of maximum deviation encountered in the operation of nuclear reactors is dealt with, as well as an implicit variational problem of the determinist type, implicit variational problems of the aleatory type, etc. In chapter X the results regarding optimizing processes with linear equations and square criteria are outlined.

In the following chapter XI, an application of the method "approximations in the domain of strategies", particularly adequate to the Markov type decision processes is presented, and several applications are expounded.

The last chapter deals with some common aspects of all the problems discussed in the book, namely the accuracy and stability of dynamic programming methods.

Four additions are given at the end of the book, containing a series of recent results obtained in dynamic programming by O. Gross, M. Freimer and W. Karush in collaboration with Bellman and Dreyfus.

A fifth addition contains a description of the *RAND Johnniac* computer by means of which the results presented in this volume have been obtained.

Owing to the multitude of problems approached this work is of undisputable scientific value. It is intended for the mathematicians, economists and engineers who work in operational research and its applications, and its translation and publishing in Romanian is undoubtedly another step in view of making it easily accessible to an ever wider range of specialists.

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