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BERECHNUNG OPTIMALER STEUERUNGEN. MAXIMUMPRINZIP UND DYNAMISCHE OPTIMIERUNG

(Determination of Optimal Management. The Maximum Principle and Dynamic Optimizations.)

Lecture Notes in Operations Research and Mathematical Systems

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The theory of optimal control facilitates the approach of a great many practical problems whose solution would not be possible by means of the classical variational methods. Therefore, this theory has now become one of the highly refined tools used in operations research as well as in econometrics. Results already achieved on these lines must be emphasized, especially with respect to the question of establishing an optimal investment policy over a specified time interval, as well as in as wide an area as the theory of economic growth.

The authors attempt to make a unitary presentation of the two basic concepts of optimal control, namely the dynamic optimization method and Pontryagin's maximum principle.

The book begins with a review of some examples of control problems encountered in actual practice. The overall framework of optimal control and the terms of stating the problem are formulated, several necessary basic propositions being set forth throughout the exposition.

Two methods designed for the solution of dynamic optimization, using Bellman's principle are discussed. The conditions required to insure convergence of these methods are given and the existing possibilities for their numerical achievement are discussed. Simultaneously, the chief results of dynamic programming are briefly described.

Pontryagin's maximum principle and the transversality conditions are formulated for the general, non-linear case. Based on the maximum principle, a series of minor control problems are discussed in detail: problems with a fixed final point and minimum time problems. Finally, two solving procedures for the non-linear control problems are suggested.

It is our opinion that this book provides the reader with a definite idea about the main aspects shown by the optimal control theory and about its current development stage. Moreover, it is worth pointing out that the problems raised by optimal control are dealt with both theoretically and in the light of numerical achievements. Although not being a large-size work, it is, however, dense as to the ideas it conveys and as to the subject matter the authors make available to the readers.

This work is designed not only for mathematicians and for other categories of experts concerned with optimal control matters. With a view to facilitating the study of the scientific material it provides, the book comprises an appendix which contains the basic concepts relating to the theory of functions and of convex sets, to the integral theory, as well as to the concepts of functional analysis utilized throughout the book.

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