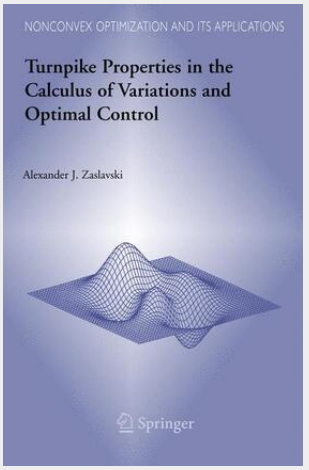
Zaslavski

Turnpike Properties in the Calculus of Variations and Optimal Control



This monograph is devoted to recent progress in the turnpike t- ory. Turnpike properties are well known in mathematical economics. The term was ?rst coined by Samuelson who showed that an e?cient expanding economy would for most of the time be in the vicinity of a balanced equilibrium path (also called a von Neumann path) [78, 79]. These properties were studied by many authors for optimal trajec- ries of a Neumann–Gale model determined by a superlinear set-valued mapping. In the monograph we discuss a number of results conce- ing turnpike properties in the calculus of variations and optimal control which were obtained by the author in the last ten years. These results showthattheturnpikepropertiesareageneralphenomenonwhichholds for various classes of variational problems and optimal control problems. Turnpike properties are studied for optimal control problems on- nite time intervals [T ,T] of the real line. Solutions of such problems 1 2 (trajectories) always depend on the time interval [T ,T], an optimality 1 2 criterion which is usually determined by a cost function, and on data which is some initial conditions. In the turnpike theory we are int- ested in the structure of solutions of optimal problems. We study the behavior of solutions when an optimality criterion is ?xed while T ,T 1 2 andthedatavary.

This book is devoted to the recent progress on the turnpike theory. The turnpike property was discovered by Paul A. Samuelson, who applied it to problems in mathematical economics in 1949. These properties were studied for optimal trajectories of models of economic dynamics determined by convex processes. In this monograph the author, a leading expert in modern turnpike theory, presents a number of results concerning the turnpike properties in the calculus of variations and optimal control which were obtained in the last ten years. These results show that the turnpike properties form a general phenomenon which holds for various classes of variational problems and optimal control problems. The book should help to correct the misapprehension that turnpike properties are only special features of some narrow classes of convex problems of mathematical economics. Audience This book is intended for mathematicians interested in optimal control, calculus of variations, game theory and mathematical economics.

106,99 €
99,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9780387281551
Medium: Buch
ISBN: 978-0-387-28155-1
Verlag: Springer Nature Singapore
Erscheinungstermin: 25.08.2005
Sprache(n): Englisch
Auflage: 2006. Auflage 2005
Serie: Nonconvex Optimization and Its Applications
Produktform: Gebunden
Gewicht: 1016 g
Seiten: 396
Format (B x H): 163 x 241 mm

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