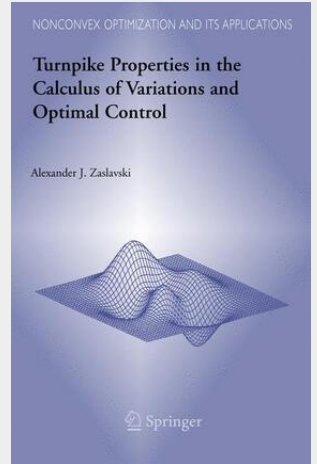


Turnpike Properties in the Calculus of Variations and Optimal Control

This monograph is devoted to recent progress in the turnpike theory. Turnpike properties are well known in mathematical economics. The term was first coined by Samuelson who showed that an efficient 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 trajectories of a Neumann–Gale model determined by a superlinear set-valued mapping. In the monograph we discuss a number of results concerning turnpike properties in the calculus of variations and optimal control which were obtained by the author in the last ten years. These results show that the turnpike properties are a general phenomenon which holds for various classes of variational problems and optimal control problems. Turnpike properties are studied for optimal control problems on finite time intervals $[T_1, T_2]$ of the real line. Solutions of such problems (trajectories) always depend on the time interval $[T_1, T_2]$, an optimality criterion which is usually determined by a cost function, and on data which is some initial conditions. In the turnpike theory we are interested in the structure of solutions of optimal problems. We study the behavior of solutions when an optimality criterion is fixed while T_1, T_2 and the data vary.

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.



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