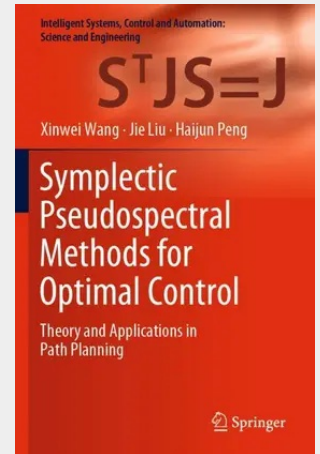


Symplectic Pseudospectral Methods for Optimal Control

Theory and Applications in Path Planning

The book focuses on symplectic pseudospectral methods for nonlinear optimal control problems and their applications. Both the fundamental principles and engineering practice are addressed. Symplectic pseudospectral methods for nonlinear optimal control problems with complicated factors (i.e., inequality constraints, state-delay, unspecific terminal time, etc.) are solved under the framework of indirect methods. The methods developed here offer a high degree of computational efficiency and accuracy when compared with popular direct pseudospectral methods. The methods are applied to solve optimal control problems arising in various engineering fields, particularly in path planning problems for autonomous vehicles. Given its scope, the book will benefit researchers, engineers and graduate students in the fields of automatic control, path planning, ordinary differential equations, etc.

Background.- Numerical methods for computational optimal control.- Mathematical foundations.- SPM for general nonlinear unconstrained optimal control problems.- SPM for nonlinear optimal control problems with inequality constraints.- SPM for nonlinear state-delayed optimal control problems.- From open-loop to closed-loop: Model predictive control.- Optimal maneuver of spacecraft.- Optimal path planning of UGS.- Overhead crane.- Carrier aircraft (traction system).- Optimal vaccination strategy for a seasonally varying epidemic model.



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