

<<拟线性双曲系统的能控性与能观性>>

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前言

The controllability and observability are of great importance in both theory and applications. A complete theory has been established for linear hyperbolic systems, in particular, for linear wave equations. There have also been some results for semilinear wave equations. For quasilinear hyperbolic systems, however, very few results have been published even in the one-space-dimensional (1-D) case. In this monograph based mainly on the results obtained by the author and his collaborators in recent years, by means of the theory on the semi-global classical solution, a simple and direct constructive method is presented in a systematic way to get both the controllability and observability in the framework of classical solutions for general first order 1-D quasilinear hyperbolic systems with general nonlinear boundary conditions, and corresponding applications are given for 1-D quasilinear wave equations and for unsteady flows in a tree-like network of open canals, respectively. This will be of benefit to scholars and graduate students in applied mathematics and in applied sciences. The Appendix given at the end of this monograph is specially written for those readers who are not familiar with quasilinear hyperbolic systems. I would like to take this opportunity to express my sincere thanks to the late professor J.-L. Lions, who initiated and brought me into the area of control theory, for his encouragement and guidance. My special thanks are due to Bopeng Rao, Binyu Zhang, Yi Jin, Lixin Yu, Zhiqiang Wang and Qilong Gu for their kind cooperation in the course of research on this subject, supported by the National Basic Research Program of China (973 Program) (2007CB814800). Finally, I am also indebted to Ms. Chunlian Zhou for her patient and efficient work in editing this book.

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内容概要

The controllability and observability are of great importance in both theory and applications. A complete theory has been established for linear hyperbolic systems, in particular, for linear wave equations. There have also been some results for semilinear wave equations. For quasilinear hyperbolic systems that have numerous applications in mechanics, physics and other applied sciences, however, very few results are available even with space dimension one. This monograph is based mainly on the results obtained by the author and his collaborators in recent years. By means of the theory on the semi-global classical solution, a simple and direct constructive method is presented in a systematic way to get both the controllability and observability in the framework of classical solutions for general first order 1-D quasilinear hyperbolic systems with general nonlinear boundary conditions. Corresponding applications are given for 1-D quasilinear wave equations and for unsteady flows in a tree-like network of open canals, respectively. More than one hundred related references are provided.

This book with 11 chapters is self-contained. An appendix is especially written for those readers who are not familiar with quasilinear hyperbolic systems. This book will be of benefit to scholars and graduate students in applied mathematics and applied sciences. It may be used as a textbook or a main reference for graduate students in corresponding areas.

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