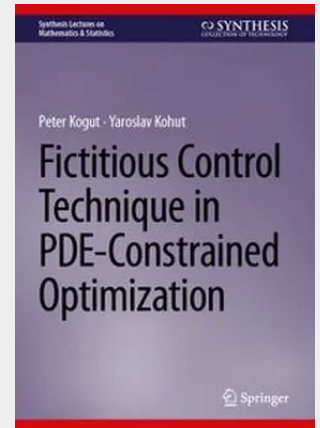


Fictitious Control Technique in PDE-Constrained Optimization

This book develops the concept of fictitious controls for studying optimal control problems associated with nonlinear elliptic and parabolic equations. The authors address several challenges currently faced by researchers, particularly those arising in optimization problems for degenerate boundary value problems (BVPs), boundary value problems associated with coupled systems of essentially nonlinear partial differential equations (PDEs), as well as in problems where uniqueness of solutions cannot be expected in standard functional spaces due to degeneracy and/or 1-data. An emphasis is placed on optimization problems that are ill-posed or involve nonstandard nonlinearity such as quadratic terms, exponential terms, and/or degenerate elliptic operators. These problems are not just theoretical, but rather have practical applications in various fields, including mechanics, chemistry, and image processing. As such, the authors provide mathematical tools that can be used to solve complex problems in different areas of fundamental and applied science. The book further explores optimization problems for nonlinear degenerate partial differential equations with control and state constraints using the concept of fictitious controls and provides a comprehensive treatment of the wide class of optimal control problems for Perona-Malik equations, investigating the existence of optimal solutions and methods for their approximation. Additionally, the book includes innovative research in the regularity issues of the variational and duality solutions of boundary value problems for degenerate elliptic equations with mixed boundary conditions. The book is a valuable resource for researchers and graduate students in optimization theory, approximation methods, and partial differential equations.

Explores the life-cycle optimization problems for thermo-mechanical systems with damage evolution Discusses regularization schemes that are suitable for numerical simulations with a prescribed level of accuracy Presents novel approaches to the study of optimal control problems that frequently arise in practical applications



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