Barbu, Viorel
Analysis and control of nonlinear infinite dimensional systems. (English) ｜Zbl 0776.49005｜
Mathematics in Science and Engineering. 190. Boston: Academic Press, Inc.. x, 476 p. (1993).

The optimal control problems studied in this book are governed by state equations of the form $Ay = Bu + f$ and $y' + Ay = Bu + f$, where A is a nonlinear accretive (multivalued) operator in a Banach space X, B is a linear continuous operator from a controller space U to X, and u is the control parameter. The cost functional is in general not differentiable, and since the state equation is nonlinear this leads to a nonsmooth and nonconvex optimization problem. The book is written in a dual perspective, analysis-synthesis taking into account that in contemporary mathematics control theory is complementarily related to the analysis of differential systems.

The first chapter contains preliminaries, and the second one deals with nonlinear operators of monotone type. Chapter 3 is concerned with optimal control problems governed by variational inequalities of elliptic type and semilinear elliptic equations. The main emphasis is put on first order necessary conditions of optimality obtained by an approximating regularizing process. The general theory is applied to controlled free boundary problems such as the obstacle problem and the Signorini problem. Chapter 4 is devoted to the Cauchy problem associated with nonlinear accretive operators in Banach space. The main result is related to the Crandall-Liggett exponential formula for autonomous equations. Applications are given to nonlinear parabolic equations and variational inequalities, first order quasilinear equations, the nonlinear diffusion equations, and nonlinear hyperbolic equations. Optimal control problems governed by semilinear parabolic equations and by parabolic variational inequalities are considered in Chapter 5. Chapter 6 is concerned with the feedback representation of optimal controllers to problems considered in the previous chapter.

The book contains an extensive list of references and every chapter is concluded by very interesting bibliographical notes and remarks.

Reviewer: V.Arnautu (Iaşi)

MSC:

49J20	Existence theories for optimal control problems involving partial differential equations	Cited in **4** Reviews
49K20	Optimality conditions for problems involving partial differential equations	Cited in **234** Documents
49L20	Dynamic programming in optimal control and differential games	
49L25	Viscosity solutions to Hamilton-Jacobi equations in optimal control and differential games	
49-02	Research exposition (monographs, survey articles) pertaining to calculus of variations and optimal control	

Keywords:

optimal control; nonsmooth and nonconvex optimization; nonlinear operators of monotone type; variational inequalities of elliptic type; semilinear elliptic equations; obstacle problem; Signorini problem; Cauchy problem; nonlinear accretive operators in Banach space; nonlinear diffusion equations; nonlinear hyperbolic equations; semilinear parabolic equations