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Notwendige Optimalitätsbedingungen in der mehrkriteriellen Optimierung mit Anwendung auf Steuerungsprobleme. (Necessary optimality conditions in multi-criterial optimization with application to control problems.). (German) [Zbl 0695.49019](#)
Erlangen: Univ. Erlangen, Naturwiss. Fak., Diss. 110 S. (1989).

This dissertation consists of three chapters. In chapter 1 various notions of weak differentiability and conical approximations are discussed. Chapter 2 treats necessary optimality conditions for vector optimization problems in general spaces, and chapter 3 gives applications, mainly to ordinary and parabolic differential equations.

The author's aim is to develop a general theory of first order necessary optimality conditions which (a) relaxes the requirement of Frechet differentiability not only in the cost functional, but also in the constraint mappings, and (b) yields multiplier rules which can be applied to dynamic optimization problems. To this end, he collects, discusses and refines many results of "abstract" optimization theory, in particular concerning constraint qualifications. For his approach, which he associates with the names of Dubovitskij-Milyutin and Guignard, he claims that it is, as compared to other approaches, "not only more elegant and more economical w.r.t. proofs, but also farther reaching, at least for PDE constraints". He discusses two PDE problems, one with a semilinear and one with a quasilinear state equation. However, the way these examples are presented does not really help the reader to convince himself of this superiority or to apply the results to a specific parabolic control problem formulated in the usual manner.

Reviewer: [M.Brokate](#)

MSC:

- [49K27](#) Optimality conditions for problems in abstract spaces
- [49K15](#) Optimality conditions for problems involving ordinary differential equations
- [49K20](#) Optimality conditions for problems involving partial differential equations
- [90C31](#) Sensitivity, stability, parametric optimization

Cited in **1** Document

Keywords:

weak differentiability; conical approximations; vector optimization problems; necessary optimality conditions; multiplier rules; constraint qualifications