Lagrange multiplier approach to variational problems and applications

Ito, Kazufumi, author

Deskripsi Lengkap: https://lib.ui.ac.id/detail?id=20450687&lokasi=lokal

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Abstrak

Lagrange multiplier theory provides a tool for the analysis of a general class of nonlinear variational problems and is the basis for developing efficient and powerful iterative methods for solving these problems. This comprehensive monograph analyzes Lagrange multiplier theory and shows its impact on the development of numerical algorithms for problems posed in a function space setting. The book is motivated by the idea that a full treatment of a variational problem in function spaces would not be complete without a discussion of inﬁnite-dimensional analysis, proper discretization, and the relationship between the two.

The authors develop and analyze efficient algorithms for constrained optimization and convex optimization problems based on the augumented Lagrangian concept and cover such topics as sensitivity analysis, convex optimization, second order methods, and shape sensitivity calculus. General theory is applied to challenging problems in optimal control of partial differential equations, image analysis, mechanical contact and friction problems, and American options for the Blackcholes model.