Oliver Schütze:
Set Oriented Methods for Global Optimization

Doctoral Thesis, 2004, research group "Applied Mathematics"
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Abstract

The personal improvement is an inherent desire of every individual. Since the beginning *optimization* has been a very active field in mathematics though a thorough and beautiful theory was developed only in the 1950s when computers became available. Both new generations of computers with rapidly growing capacities and new problems arising from ever advancing applications, call perpetually for new optimization methods. The scope of this thesis is to give a contribution to that issue, to develop new techniques for the solution of modern optimization problems. To be more precise, we propose in this work numerous schemes for the numerical treatment of some global optimization problems.
Most of the algorithms which are presented here are based on particular set–oriented multi–level schemes. Using these *subdivision techniques* we propose several adaptive algorithms for the location of zeros within a prescribed compact region in $\mathbb{R}^n$ (and $\mathbb{C}$ respectively, see Chapters 3 and 4).
Furthermore, we address the problem of the location of the stability regions of parameter dependent delay differential equations (Chapter 5).
The main part of this thesis consists of the numerical schemes for the computation of the set of solutions for multi–objective optimization problems (Chapter 6). One interesting result of this thesis are set–oriented continuation–like methods for models where the objectives are twice continuously differentiable. These algorithms can also be used for the computation of general implicitly defined manifolds, even in higher dimensional space. This allows for the efficient computation of optimization models with equality constraints.