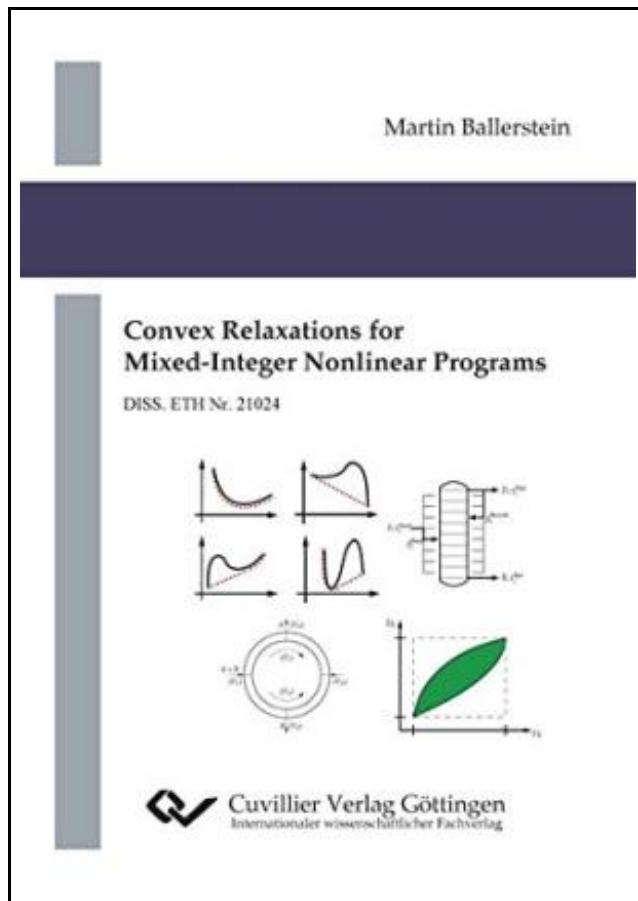


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Cuvillier Verlag Sep 2013, 2013. Taschenbuch. Book Condition: Neu. 210x149x17 mm. Neuware - This thesis deals with new techniques to construct a strong convex relaxation for a mixed-integer nonlinear program (MINLP). While local optimization software can quickly identify promising operating points of MINLPs, the solution of the convex relaxation provides a global bound on the optimal value of the MINLP that can be used to evaluate the quality of the local solution. Certainly, the efficiency of this evaluation is strongly dependent on the quality of the convex relaxation. Convex relaxations of general MINLPs can be constructed by replacing each nonlinear function occurring in the model description by convex underestimating and concave overestimating functions. In this setting, it is desired to use the best possible convex underestimator and concave overestimator of a given function over an underlying domain -- the so-called convex and concave envelope, respectively. However, the computation of these envelopes can be extremely difficult so that analytical expressions for envelopes are only available for some classes of well-structured functions. Another factor influencing the strength of the estimators is the size of the underlying domain: The smaller the domain, the better the quality of the estimators. In many applications the initial domains of the variables are chosen rather conservatively while tighter bounds are implicitly given by the constraint set of the MINLP. Thus, bound tightening techniques, which exploit the information of the constraint set, are an essential ingredient to improve the estimators and to accelerate global optimization algorithms. The focus of this thesis lies on the development and computational analysis of new convex relaxations for MINLPs, especially for two applications from chemical engineering. In detail, we derive a new bound tightening technique for a general structure used for modeling chemical processes and provide different approaches to generate strong convex relaxations...

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