

# THEORETICAL ASPECTS OF ADOPTING EXACT PENALTY ELEMENTS WITHIN SEQUENTIAL METHODS FOR NONLINEAR PROGRAMMING\*

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**Abstract.** In the context of sequential methods for solving general nonlinear programming problems, it is usual to work with augmented subproblems instead of the original ones, tackled by the  $\ell_1$ -penalty function together with the shortcut usage of a convenient penalty parameter. This paper addresses the theoretical reasoning behind handling the original subproblems by such an augmentation strategy, by means of the differentiable reformulation of the  $\ell_1$ -penalized problem. The convergence properties of related sequences of problems are analyzed. Furthermore, examples that elucidate the interrelations among the obtained results are presented.

**Key words.** nonlinear programming, penalty function, smooth reformulation, feasibility, KKT conditions, Mangasarian-Fromovitz constraint qualification

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