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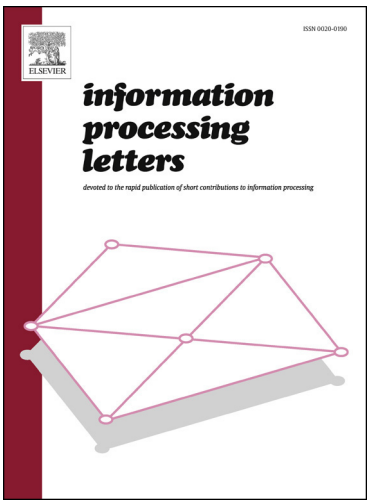

Inexact feasibility pump for mixed integer nonlinear programming

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Inexact Feasibility Pump for Mixed Integer Nonlinear Programming

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Abstract

The mixed integer nonlinear programming (MINLP) problem as an optimization problem involves both continuous and discrete variables. Moreover, at least one of the functions defining the objective function or the constraints must be nonlinear. Because of its complexity, it is very difficult to obtain the exact optimal solution. Therefore, the heuristic methods for getting a feasible solution of MINLPs are very important in practice. The feasibility pump is one of the famous heuristic methods, which alternates between solving nonlinear programming (NLP) problems and mixed integer linear programming (MILP) relaxed master problems.

In this paper, we will extend the feasibility pump to the case where the NLP problems are solved inexactly and propose the convergence of this method under some conditions. Moreover, we present the study of inexactness of the Lagrange multipliers (which are returned negative) of the NLP subproblems.

Keywords: Mixed integer nonlinear programming, feasibility pump, Lagrange multipliers, inexactness, heuristic

1 Introduction

The mixed integer nonlinear programming (MINLP) problem is an optimization problem with both continuous and discrete variables. Moreover, at least one of the functions defining the objective function or the constraints must be nonlinear. We denote the MINLP problems in the following form:

$$(\text{MINLP}) \begin{cases} \min & F(x,y) \\ \text{s.t.} & G(x,y) \leq 0, \\ & x \in X \cap \mathbb{Z}^{n_1},\ y \in Y, \end{cases}$$

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