Bundle methods with approximate subgradient linearizations

Krzysztof C. Kiwiel

Systems Research Institute, Polish Academy of Sciences
Newelska 6, 01-447 Warsaw, Poland

e-mail: kiwiel@ibspan.waw.pl

Abstract

We discuss proximal bundle methods for minimizing $f(u)$ subject to $h(u) \leq 0$, $u \in C$, where f, h and $C \subset \mathbb{R}^m$ are convex. We only require evaluating f, h and their subgradients with an accuracy $\epsilon \geq 0$, which is fixed but possibly unknown. The methods employ an exact penalty function with an updated coefficient, or a combination of the classic method of centers' improvement function with an exact penalty function, without needing a feasible starting point. They asymptotically find points with at least ϵ-optimal f-values that are ϵ-feasible. When applied to the solution of LP programs arising in column generation approaches to integer programming problems, they allow for ϵ-accurate solutions of column generation subproblems.

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Keywords: nondifferentiable optimization, convex programming, proximal bundle methods, approximate subgradients, Lagrangian relaxation, column generation.

References

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