Constrained Separating Plane Algorithm with Additional Clipping

Evgeniya Vorontsova

Far Eastern Federal University,
Suhanova St. 8, 690950 Vladivostok, Russia
vorontsovaea@gmail.com

Abstract. The constrained separating plane method with additional clippings (SPACLIP-CON) for nonsmooth optimization is proposed in this paper. The method is efficient and widely applicable to nonsmooth constrained optimization problems with convex objective functions. Experimental results for solving large-scale non-smooth problems are provided.

Keywords: Nonsmooth convex optimization, Subgradient methods, Black-box minimization, Separating plane method, SPACLIP, SPACLIP-CON, Large-scale optimization

We consider the following problem of constrained convex nondifferentiable optimization: $\min\limits_{x \in Q} f(x)$, where $f(x)$ is a convex nonsmooth objective function, $x \in \mathbb{R}^n$, $Q = \{x \in \mathbb{R}^n \,|\, h(x) \leq 0\}$, $h(x)$ is a constraint nonsmooth scalar function.

This article is devoted to the further investigation of separating plane methods [1–4]. Methods work in the extended conjugate space of subgradients and the Legendre-Fenchel conjugate of $f(x)$ $f^*(g) = \sup\limits_x \{gx - f(x)\}$. The development of SPACLIP-CON method for the constrained problems is based on the idea of introduction of the conical approximation of a non-trivial recession cone that belongs to the epigraph of the $f(x)$ into the inner approximation of the epi f^*.

References

1. Nurminski, E.A.: Separating Plane Algorithms for Convex Optimization. Math. Program. 76, 373–391 (1997)
2. Vorontsova, E.: Extended Separating Plane Algorithm and NSO-Solutions of PageRank Problem. In: Kochetov, Yu., Khachay, M., Beresnev, Vl., Nurminski, E., Pardalos, P. (eds) DOOR 2016. LNCS, vol. 9869, pp. 547–560. Springer (2016)
3. Vorontsova, E.A., Nurminski, E.A.: Synthesis of Cutting and Separating Planes in a Nonsmooth Optimization Method. Cybernetics and Systems Analysis. 51(4), 619–631 (2015)
4. Nurminski, E.: Multiple Cuts in Separating Plane Algorithms. In: Kochetov, Yu., Khachay, M., Beresnev, Vl., Nurminski, E., Pardalos, P. (eds) DOOR 2016. LNCS, vol. 9869, pp. 430–440. Springer (2016)