A Dynamic Scaling Approach for Bundle Methods in Convex Optimization

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Abstract

A canonical bundle method for convex optimization generates the next candidate point by minimizing a quadratic subproblem. Typically, this consists of a piecewise linear cutting model of the convex function formed from collected subgradient information and a quadratic proximal term keeping the candidate close to the current center of stability. For convergence a minimal cutting model consisting of a so called aggregate (cutting plane) and the latest subgradient inequality suffices. This allows to trade quality of the model against solution time of the subproblem. We propose a systematic approach for including subgradient information in the proximal term in order to support reduced size models. In the smooth case this term should mimic the Hessian and we highlight some theoretical connections in this respect. The practical benefits of the approach will be illustrated by numerical experiments on a class of large scale instances from practice using the callable library ConicBundle.