Intrinsic Linear Algebra Subjects in Bundle Methods for Convex and Conic Optimization

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In the majority of current large scale convex optimization applications, subgradient algorithms dominate today because they are easy to implement, they have low iteration complexity and yet exhibit optimal convergence rates for first order oracles. Bundle methods try to make better use of the same information by forming a cutting model from collected subgradient information and by determining the next candidate as the minimizer of the model augmented with a proximal term. While their convergence properties are much harder to analyze, the choice of cutting model and proximal term offers a lot of flexibility. Suitable choices may even allow to move towards second order behavior. After a short introduction to bundle methods in general, we discuss such choices for the general and the semidefinite case. In this we highlight linear algebra issues related to selecting and solving subproblems efficiently. We also report on some experience gathered via the callable library ConicBundle which could definitely profit from a better mastering of several linear algebra aspects.