Multicommodity flows

Jean-Philippe Vial
Department of Management Studies, University of Geneva

We propose new algorithmic developments to solve multicommodity flow problems with linear costs and capacity constraints and nonlinear costs also. We show that the Lagrangian dual is a convex optimization problem whose objective function is made of two terms: a nondifferentiable one and a smooth one.

We solve the dual using Proximal-ACCPM, a recent enhancement of the analytic center cutting plane method. In the presentation, we shall discuss two further extensions. The first one applies to linear multicommodity flows and consists in an active set strategy. The second one applies the nonlinear case: the smooth component of the objective is treated via a nonlinear cut.

In our numerical experiments, we use classical test problems. We show that we significantly improve on previously developed methods. In particular, we can solve huge problem instances, with up to 14000 nodes, 40000 arcs and 2000000 commodities.