

# Convex Cost Multicommodity Flow Problems: Applications and Algorithms

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## Abstract

We review and analyze nonlinear programming approaches to modeling and solving certain flow problems in telecommunications, transportation and supply chain management. We emphasize the common aspects of telecommunications and road networks, and indicate the importance of game theoretic and equilibrium approaches. Algorithms based on the Frank-Wolfe method are developed in depth and their implementations on sequential and parallel machines are discussed and evaluated for large-scale real-world networks. Several research directions are also stated.

**Keywords:** nonlinear optimization, Frank-Wolfe algorithm, conditional gradient algorithm, flow deviation algorithm, regularized Frank-Wolfe algorithm, simplicial decomposition, routing, flow assignment, traffic assignment, transportation problems, equilibrium flows, team games, Nash equilibrium, Wardrop's principle, bilevel programming, Stackelberg game, capacity assignment, network design, supply chain management, parallel computing