

## REFERENCES

- [1] AGGARWAL, A., OBLAK, M., and VEMUGANTI, R., “A heuristic solution procedure for multicommodity integer flows,” *Computers & Operations Research*, vol. 22, pp. 1075–1087, Dec 1995.
- [2] AHO, A., HOPCROFT, J., and ULLMAN, J., *The design and analysis of computer algorithms*. Addison-Wesley, 1974.
- [3] AHUJA, R., MAGNANTI, T., and ORLIN, J., *Network flows: theory, algorithms and applications*. Englewood Cliffs, NJ: Prentice Hall, 1993.
- [4] AHUJA, R., MEHLHORN, K., ORLIN, J., and TARJAN, R., “Faster algorithms for the shortest path problem,” *Journal of ACM*, vol. 37, no. 2, pp. 213–223, 1990.
- [5] AIKENS, C., “Facility location models for distribution planning,” *European Journal of Operational Research*, vol. 22, no. 3, pp. 263–279, 1985.
- [6] ALBERS, S., GARG, N., and LEONARDI, S., “Minimizing stall time in single and parallel disk systems,” *Journal of the ACM*, vol. 47, no. 6, pp. 969–986, 2000.
- [7] ALBERS, S. and WITT, C., “Minimizing stall time in single and parallel disk systems using multicommodity network flows,” in *Approximation, Randomization and Combinatorial Optimization: Algorithms and Techniques* (GOEMANS, M., JANSEN, K., ROLIM, J., and TREVISAN, L., eds.), vol. 2129, (Berlin Heidelberg), pp. 12–23, Springer, Aug 2001.
- [8] ALBRECHT, C., “Global routing by new approximation algorithms for multicommodity flow,” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, vol. 20, pp. 622–632, May 2001.
- [9] ALI, A., BARNETT, D., FARHANGIAN, K., KENNINGTON, J., PATTY, B., SHETTY, B., MCCARL, B., and WONG, P., “Multicommodity network problems: Applications and computations,” *IIE Transactions*, vol. 16, no. 2, pp. 127–134, 1984.
- [10] ALI, A., HELGASON, R., KENNINGTON, J., and LALL, H., “Computational comparison among three multicommodity network flow algorithms,” *Operations Research*, vol. 28, no. 4, pp. 995–1000, 1980.
- [11] ALI, A. and KENNINGTON, J., “Mnetgen program documentation,” technical report 77003, Department of IEOR, Southern Methodist University, Dallas, 1977.
- [12] ALON, N., GALIL, Z., and MARGALIT, O., “On the exponent of the all pairs shortest path problem,” *Journal of Computer and System Sciences*, vol. 54, pp. 255–262, April 1997.
- [13] ALVELOS, F. and VALÉRIO DE CARVALHO, J., “Solving the multicommodity flow problem by branch-and-price,” tech. rep., Departamento de Produção e Sistemas, Universidade do Minho, Braga, Portugal, 2000.

- [14] ASANO, Y. and IMAI, H., "Practical efficiency of the linear-time algorithm for the single source shortest path problem," *Journal of the Operations Research Society of Japan*, vol. 43, pp. 431–447, December 2000.
- [15] ASSAD, A., "Multicommodity network flows-a survey," *Networks*, vol. 8, no. 1, pp. 37–91, 1978.
- [16] ASSAD, A., "Modelling of rail networks: toward a routing/makeup model," *Transportation Research, Part B (Methodological)*, vol. 14B, no. 1-2, pp. 101–114, 1980.
- [17] ASSAD, A., "Solving linear multicommodity flow problems," in *Proceedings of the IEEE International Conference on Circuits and Computers ICC 80*, pp. 157–161, October 1980.
- [18] ATKINSON, D. and VAIDYA, P., "A cutting plane algorithm for convex programming that uses analytic centers," *Mathematical Programming*, vol. 69, no. 1, Ser.B, pp. 1–43, 1995.
- [19] AWERBUCH, B. and LEIGHTON, T., "A simple local-control approximation algorithm for multicommodity flow," in *Proceedings of the 34th annual IEEE Symposium on Foundations of Computer Science*, pp. 459–468, IEEE, 1993.
- [20] AWERBUCH, B. and LEIGHTON, T., "Improved approximations for the multicommodity flow problem and local competitive routing in networks," in *Proceedings of the twenty-sixth annual ACM symposium on Theory of computing*, (New York, NY, USA), pp. 487–496, ACM Press, 1994.
- [21] BACKHOUSE, R. and CARRÉ, B., "Regular algebra applied to path finding problems," *Journal of the Institute of Mathematics and Its Applications*, vol. 15, pp. 161–186, April 1975.
- [22] BACKHOUSE, R. and CARRÉ, B., "A comparison of gaussian and gauss-jordan elimination in regular algebra," *International Journal of Computer Mathematics*, vol. 10, no. 3-4, pp. 311–325, 1982.
- [23] BAHINSE, L., BARAHONA, F., and PORTO, O., "Solving steiner tree problems in graphs with lagrangian relaxation," rc 21846, Research Division, IBM T.J. Watson Research Center, Yorktown Heights, NY, 2000.
- [24] BARAHONA, F. and ANBIL, R., "The volume algorithm: producing primal solutions with a subgradient method," *Mathematical Programming*, vol. 87, no. 3, Ser. A, pp. 385–399, 2000.
- [25] BARAHONA, F. and ANBIL, R., "On some difficult linear programs coming from set partitioning," *Discrete Applied Mathematics*, vol. 118, pp. 3–11, Apr 2002.
- [26] BARAHONA, F. and CHUDAK, F., "Near-optimal solutions to large scale facility location problems," rc 21606, IBM Research Division, T.J. Watson Research Center, Yorktown Heights, New York, 1999.
- [27] BARAHONA, F. and CHUDAK, F., "Solving large scale uncapacitated facility location problems," in *Approximation and complexity in numerical optimization : continuous*

- and discrete problems (v.42) (PARDALOS, P., ed.), pp. 48–62, Dordrecht: Kluwer Academic Publishers, 2000.
- [28] BARNES, E., CHEN, V., GOPALAKRISHNAN, B., and JOHNSON, E., “A least squares primal-dual algorithm for solving linear programming problems,” *Operations Research Letters*, vol. 30, pp. 289–294, Oct 2002.
  - [29] BARNES, E., GOPALAKRISHNAN, B., JOHNSON, E., and SOKOL, J., “A combined objective least-squares algorithm.” in preparation.
  - [30] BARNES, E., GOPALAKRISHNAN, B., JOHNSON, E., and SOKOL, J., “A least-squares network flow algorithm.” in preparation.
  - [31] BARNETT, D., BINKLEY, J., and MCCARL, B., “Port elevator capacity and national and world grain shipments,” *Western Journal of Agricultural Economics*, vol. 9, pp. 77–84, 1984.
  - [32] BARNHART, C., *A network-based primal-dual solution methodology for the multicommodity network flow problem*. PhD thesis, Transportation Systems Division, M.I.T., Cambridge, MA, 1988.
  - [33] BARNHART, C., “Dual-ascent methods for large-scale multicommodity flow problems,” *Naval Research Logistics*, vol. 40, pp. 305–324, April 1993.
  - [34] BARNHART, C., HANE, C., and VANCE, P., “Integer multicommodity flow problems,” in *Integer programming and combinatorial optimization, Proceedings of the 5th International Conference (IPCO V) held in Vancouver, BC, Canada* (CUNNINGHAM, W., MCCORMICK, S., and QUEYRANNE, M., eds.), vol. 1084, (Berlin Heidelberg), pp. 58–71, Springer, Jun 1996.
  - [35] BARNHART, C., HANE, C., and VANCE, P., “Using branch-and-price-and-cut to solve origin-destination integer multicommodity flow problems,” *Operations Research*, vol. 48, no. 2, pp. 318–326, 2000.
  - [36] BARNHART, C., JOHNSON, E., HANE, C., and SIGISMONDI, G., “An alternative formulation and solution strategy for multicommodity network flow problems,” *Telecommunication Systems*, vol. 3, pp. 239–258, 1995.
  - [37] BARNHART, C., JOHNSON, E., NEMHAUSER, G., SAVELSBERGH, M., and VANCE, P., “Branch-and-price: column generation for solving huge integer programs,” *Operations Research*, vol. 46, no. 3, pp. 316–329, 1998.
  - [38] BARNHART, C. and SHEFFI, Y., “A network-based primal-dual heuristic for the solution of multicommodity network flow problems,” *Transportation Science*, vol. 27, pp. 102–117, May 1993.
  - [39] BAZARRA, M., HURLEY, J., JOHNSON, E., NEMHAUSER, G., SOKOL, J., WANG, I.-L., CHEW, E., HUANG, H., MOK, I., TAN, K., and TEO, C., “The asia pacific air cargo system,” Tech. Rep. TLI-AP/00/01, The Logistics Institute-Asia Pacific, 2000.
  - [40] BELLMAN, R., “On a routing problem,” *Quarterly of Applied Mathematics*, vol. 16, pp. 87–90, 1958.

- [41] BELLMORE, M., BENNINGTON, G., and LUBORE, S., "A multivehicle tanker scheduling problem," *Transportation Science*, vol. 5, pp. 36–47, 1971.
- [42] BENDERS, J., "Partitioning procedures for solving mixed-variables programming problems," *Numerische Mathematik*, vol. 4, pp. 238–252, 1962.
- [43] BERTSEKAS, D., "A unified framework for primal-dual methods in minimum cost network flow problems," *Mathematical Programming*, vol. 32, no. 2, pp. 125–145, 1985.
- [44] BERTSEKAS, D., "A simple and fast label correcting algorithm for shortest paths," *Networks*, vol. 23, pp. 703–709, December 1993.
- [45] BERTSEKAS, D., *Network ptimization: continuous and discrete models*. P.O. Box 391, Belmont, MA 02178-9998: Athena Scientific, 1998.
- [46] BERTSEKAS, D., HOSSEIN, P., and TSENG, P., "Relaxation methods for network flow problems with convex arc costs," *SIAM Journal on Control and Optimization*., vol. 25, no. 5, pp. 1219–1243, 1987.
- [47] BERTSEKAS, D., PALLOTTINO, S., and SCUTELLÀ, M., "Polynomial auction algorithms for shortest paths," *Computational Optimization and Applications*, vol. 4, pp. 99–125, April 1995.
- [48] BIENSTOCK, D., "Approximately solving large-scale linear programs. i: Strengthening lower bounds and accelerating convergence," Tech. Rep. CORC Report 1999-1, Department of IEOR, Columbia University, New York, NY, 1999.
- [49] BIENSTOCK, D., "Potential function methods for approximately solving linear programming problems: Theory and practice," tech. rep., CORE, Université catholique de Louvain, Belgium, 2001.
- [50] BIENSTOCK, D., CHOPRA, S., GÜNLÜK, O., and TSAI, C.-Y., "Minimum cost capacity installation for multicommodity network flows," *Mathematical Programming*, vol. 81, no. 2, Ser. B, pp. 177–199, 1998.
- [51] BIENSTOCK, D. and GÜNLÜK, O., "Computational experience with a difficult mixed-integer multicommodity flow problem," *Mathematical Programming*, vol. 68, no. 2, Ser. A, pp. 213–237, 1995.
- [52] BIENSTOCK, D. and MURATORE, G., "Strong inequalities for capacitated survivable network design problems," *Mathematical Programming*, vol. 89, no. 1, Ser. A, pp. 127–147, 2000.
- [53] BIENSTOCK, D. and SANIEE, I., "Atm network design: traffic models and optimization-based heuristics," *Telecommunication Systems - Modeling, Analysis, Design and Management*, vol. 16, no. 3-4, pp. 399–421, 2001.
- [54] BJÖRCK, Å., "Iterative refinement of linear least squares solution," *BIT (Nordisk Tidskrift for Informationsbehandling)*, vol. 7, pp. 257–278, 1967.
- [55] BJÖRCK, Å., "Iterative refinement of linear least squares solutions," *BIT (Nordisk Tidskrift for Informationsbehandling)*, vol. 8, no. 1, pp. 8–30, 1968.

- [56] BOURBEAU, B., CRAINIC, T., and GENDRON, B., "Branch-and-bound parallelization strategies applied to a depot location and container fleet management problem," *Parallel Computing*, vol. 26, no. 1, pp. 27–46, 2000.
- [57] BRUNETTA, L., CONFORTI, M., and FISCHETTI, M., "A polyhedral approach to an integer multicommodity flow problem," *Discrete Applied Mathematics*, vol. 101, pp. 13–36, Apr 2000.
- [58] BURTON, D., "On the inverse shortest path problem," *Département de Mathématique, Faculté des Sciences, Facultés Universitaires Notre-Dame de la Paix de Namur*, 1993.
- [59] CAPPANERA, P. and FRANGIONI, A., "Symmetric and asymmetric parallelization of a cost-decomposition algorithm for multicommodity flow problems," *INFORMS Journal on Computing*, vol. to appear, 2002.
- [60] CAPPANERA, P. and GALLO, G., "On the airline crew rostering problem," tech. rep., Dipartimento di Informatica, Università di Pisa, Oct 2001.
- [61] CARDEN, R. and CHENG, C. K., "A global router using an efficient approximate multicommodity multiterminal flow algorithm," in *28th ACM/IEEE Design Automation Conference*, pp. 316–321, ACM/IEEE, 1991.
- [62] CAROLAN, W., HILL, J., KENNINGTON, J., NIEMI, S., and WICHMANN, S., "An empirical evaluation of the korbx algorithms for military airlift applications," *Operations Research*, vol. 38, no. 2, pp. 240–248, 1990.
- [63] CARRÉ, B., *Graphs and networks*. Walton Street, Oxford OX2 6DP: Oxford University Press, 1979.
- [64] CARRÉ, B., "A matrix factorization method for finding optimal paths through networks," in *I.E.E. Conference Publication (Computer-Aided Design)*, no. 51, pp. 388–397, 1969.
- [65] CARRÉ, B., "An algebra for network routing problems," *Journal of Institute of Mathematics and Its Applications*, vol. 7, pp. 273–294, 1971.
- [66] CASTRO, J., "Solving difficult multicommodity problems through a specialized interior-point algorithm," Tech. Rep. DR20000-14, Statistics and Operations Research Dept., Universitat Politècnica de Catalunya, Pau Gargallo 5, 08028 Barcelona, Spain, Aug 2000.
- [67] CASTRO, J., "A specialized interior-point algorithm for multicommodity network flows," *SIAM Journal on Optimization*, vol. 10, no. 3, pp. 852–877, 2000.
- [68] CASTRO, J., "Solving quadratic multicommodity problems through an interior-point algorithm," Tech. Rep. DR20001-14, Statistics and Operations Research Dept., Universitat Politècnica de Catalunya, Pau Gargallo 5, 08028 Barcelona, Spain, Aug 2001.
- [69] CASTRO, J. and FRANGIONI, A., "A parallel implementation of an interior-point algorithm for multicommodity network flows," in *Vector and parallel processing—VECPAR 2000 : 4th International Conference, Porto, Portugal, June 21-23, 2000* (J.M.L.M. PALMA, J. DONGARRA, V. H., ed.), vol. 1981, pp. 301–315, Springer, 2001.

- [70] CASTRO, J. and NABONA, N., "An implementation of linear and nonlinear multicommodity network flows," *European Journal of Operational Research*, vol. 92, pp. 37–53, Jul 1996.
- [71] CERULLI, R., FESTA, P., and RAICONI, G., "Graph collapsing in shortest path auction algorithms," *Computational Optimization and Applications*, vol. 18, no. 3, pp. 199–220, 2001.
- [72] CHARDAIRE, P. and LISSER, A., "Minimum cost multicommodity flow," in *Handbook of Applied Optimization* (PARDALOS, P. and RESENDE, M., eds.), pp. 404–421, Oxford University Press, 2002.
- [73] CHARDAIRE, P. and LISSER, A., "Simplex and interior point specialized algorithms for solving non-oriented multicommodity flow problems," *Operations Research*, to appear.
- [74] CHERKASSKY, B., GOLDBERG, A., and RADZIK, T., "Shortest paths algorithms: theory and experimental evaluation," *Mathematical Programming*, vol. 73, pp. 129–174, June 1996.
- [75] CHIFFLET, J., MAHEY, P., and REYNIER, V., "Proximal decomposition for multicommodity flow problems with convex costs," *Telecommunication Systems*, vol. 3, no. 1, pp. 1–10, 1994.
- [76] CHOI, I. and GOLDFARB, D., "Solving multicommodity network flow problems by an interior point method," in *Large-scale numerical optimization (Ithaca, NY, 1989)*, (COLEMAN, T. and LI, Y., eds.), (Philadelphia, PA), pp. 58–69, SIAM, 1990.
- [77] CLARKE, S. and SURKIS, J., "An operations research approach to racial desegregation of school systems," *Socio-Economic Planning Sciences*, vol. 1, pp. 259–272, 1968.
- [78] CRAINIC, T., FERLAND, J.-A., and ROUSSEAU, J.-M., "A tactical planning model for rail freight transportation," *Transportation Science*, vol. 18, pp. 165–184, May 1984.
- [79] CRAINIC, T., "Service network design in freight transportation," *European Journal of Operational Research*, vol. 122, pp. 272–288, Apr 2000.
- [80] CRAINIC, T., DEJAX, P., and DELORME, L., "Models for multimode multicommodity location problems with interdepot balancing requirements," *Annals of Operations Research*, vol. 18, no. 1-4, pp. 279–302, 1989.
- [81] CRAINIC, T. and DELORME, L., "Dual-ascent procedures for multicommodity location-allocation problems with balancing requirements," *Transportation Science*, vol. 27, pp. 90–101, May 1993.
- [82] CRAINIC, T., DELORME, L., and DEJAX, P., "A branch-and-bound method for multicommodity location with balancing requirements," *European Journal of Operational Research*, vol. 65, no. 3, pp. 368–382, 1993.
- [83] CRAINIC, T., GENDREAU, M., SORIANO, P., and TOULOUSE, M., "A tabu search procedure for multicommodity location/allocation with balancing requirements," *Annals of Operations Research*, vol. 41, pp. 359–383, May 1993.

- [84] D'AMOURS, S., MONTREUIL, B., and SOUMIS, F., "Price-based planning and scheduling of multiproduct orders in symbiotic manufacturing networks," *European Journal of Operational Research*, vol. 96, no. 1, pp. 148–166, 1996.
- [85] DANTZIG, G., "On the shortest route through a network," *Management Science*, vol. 6, pp. 187–190, 1960.
- [86] DANTZIG, G., *Linear Programming and Extensions*. Princeton University Press, 1963.
- [87] DANTZIG, G., "All shortest routes in a graph," in *Theory of Graphs (International Symposium., Rome, 1966)*, pp. 91–92, New York: Gordon and Breach, 1967.
- [88] DANTZIG, G. and WOLFE, P., "The decomposition algorithm for linear programs," *Econometrica*, vol. 29, pp. 767–778, 1961.
- [89] DAVIS, T., GILBERT, J., LARIMORE, S., and NG, E., "A column approximate minimum degree ordering algorithm," technical report tr-00-005, Department of Computer and Information Science and Engineering, University of Florida, October 2000.
- [90] DE LEONE, R., MEYER, R., and KONTOGIORGIS, S., "Alternating directions methods for the parallel solution of large-scale block-structured optimization problems," tech. rep., Computer Sciences Technical Report 1217, Computer Science, University of Wisconsin-Madison, Feb 1994.
- [91] DEMMEL, J., GILBERT, J., and LI, X., "Superlu user's guide," September 1999.
- [92] DETLEFSEN, N. and WALLACE, S., "The simplex algorithm for multicommodity networks," *Networks*, vol. 39, no. 1, pp. 15–28, 2001.
- [93] DIAL, R., "Algorithm 360 shortest path forest with topological ordering," *Communications of the ACM*, vol. 12, pp. 632–633, 1965.
- [94] DIAL, R., GLOVER, F., KARNEY, D., and KLINGMAN, D., "A computational analysis of alternative algorithms and labeling techniques for finding shortest path trees," *Networks*, vol. 9, no. 3, pp. 215–248, 1979.
- [95] DIJKSTRA, E., "A note on two problems in connection with graphs," *Numerische Mathematik*, vol. 1, pp. 269–271, 1959.
- [96] DIVOKY, J. and HUNG, H., "Performance of shortest path algorithms in network flow problems," *Management Science*, vol. 36, pp. 661–673, June 1990.
- [97] DRUCKERMAN, J., SILVERMAN, D., and VIAROPULOS, K., *IBM optimization subroutine library guide and reference*. IBM, Kingston, NY, 1991.
- [98] DUFF, I., ERISMAN, A., and REID, J., *Direct methods for sparse matrices*. New York: Oxford University Press Inc., 1989.
- [99] ECKSTEIN, J. and FUKUSHIMA, M., "Some reformulations and applications of the alternating direction method of multipliers," in *Large scale optimization : State of the Art (Gainesville, FL, 1993)* (HAGER, W., HEARN, D., and PARDALOS, P., eds.), pp. 115–134, Kluwer Academic Publishers, 1994.

- [100] EVANS, J., "A combinatorial equivalence between a class of multicommodity flow problems and the capacitated transportation problem," *Mathematical Programming*, vol. 10, pp. 401–404, Jun 1976.
- [101] EVANS, J., "On equivalent representations of certain multicommodity networks as single commodity flow problems," *Mathematical Programming*, vol. 15, pp. 92–99, Jul 1978.
- [102] EVANS, J., "The simplex method for integral multicommodity networks," *Naval Research Logistics Quarterly*, vol. 25, pp. 31–37, Mar 1978.
- [103] EVANS, J., "A single-commodity transformation for certain multicommodity networks," *Operations Research*, vol. 26, no. 4, pp. 673–680, 1978.
- [104] EVANS, J., "The multicommodity assignment problem: a network aggregation heuristic," *Computers & Mathematics with Applications*, vol. 7, no. 2, pp. 187–194, 1981.
- [105] EVANS, J., "A network decomposition/aggregation procedure for a class of multicommodity transportation problems," *Networks*, vol. 13, no. 2, pp. 197–205, 1983.
- [106] EVANS, J., JARVIS, J., and DUKE, R., "Graphic matroids and the multicommodity transportation problem," *Mathematical Programming*, vol. 13, pp. 323–328, Dec 1977.
- [107] EVEN, S., ITAI, A., and SHAMIR, A., "On the complexity of timetable and multicommodity flow problems," *SIAM Journal on Computing*, vol. 5, no. 4, pp. 691–703, 1976.
- [108] FARBEY, B. A., LAND, A. H., and MURCHLAND, J. D., "The cascade algorithm for finding all shortest distances in a directed graph," *Management Science*, vol. 14, pp. 19–28, September 1967.
- [109] FARVOLDEN, J., POWELL, W., and LUSTIG, I., "A primal partitioning solution for the arc-chain formulation of a multicommodity network flow problem," *Operations Research*, vol. 41, no. 4, pp. 669–693, 1993.
- [110] FERRIS, M., MEERAUS, A., and RUTHERFORD, T., "Computing wardropian equilibria in a complementarity framework," *Optimization Methods and Software*, vol. 10, no. 5, pp. 669–685, 1999.
- [111] FLEISCHER, L., "Approximating fractional multicommodity flow independent of the number of commodities," *SIJDM: SIAM Journal on Discrete Mathematics*, vol. 13, no. 4, pp. 505–520, 2000.
- [112] FLORIAN, M., NGUYEN, S., and PALLOTTINO, S., "A dual simplex algorithm for finding all shortest paths," *Networks*, vol. 11, no. 4, pp. 367–378, 1981.
- [113] FLOYD, R., "Algorithm 97, shortest path," *Comm. ACM*, vol. 5, p. 345, 1962.
- [114] FORD JR., L., *Network flow theory*, pp. –923. Santa Monica, California: The RAND Corp., 1956.
- [115] FORD JR., L. and FULKERSON, D., "A suggested computation for maximal multicommodity network flows," *Management Science*, vol. 5, pp. 97–101, 1958.



- [116] FORD JR., L. and FULKERSON, D., *Flows in networks*. Princeton, NJ: Princeton University Press, 1962.
- [117] FORD JR., L. and FULKERSON, D., *Flows in networks*. Princeton, NJ: Princeton University Press, 1962.
- [118] FRANGIONI, A., *Dual ascent methods and multicommodity flow problems*. PhD thesis, Dipartimento di Informatica, Università di Pisa, May 1997.
- [119] FRANGIONI, A. and GALLO, G., “A bundle type dual-ascent approach to linear multicommodity min-cost flow problems,” *INFORMS Journal on Computing*, vol. 11, no. 4, pp. 370–393, 1999.
- [120] FRANK, M. and WOLFE, P., “An algorithm for quadratic programming,” *Naval Research Logistics Quarterly*, vol. 3, pp. 95–110, 1956.
- [121] FREDMAN, M. and TARJAN, R., “Fibonacci heaps and their uses in improved network optimization algorithms,” *Journal of the ACM*, vol. 34, no. 3, pp. 596–615, 1987.
- [122] FREDMAN, M., “New bounds on the complexity of the shortest path problems,” *SIAM Journal on Computing*, vol. 5, pp. 83–89, March 1976.
- [123] FUJISHIGE, S., “A note on the problem of updating shortest paths,” *Networks*, vol. 11, no. 3, pp. 317–319, 1981.
- [124] GABRELA, V., KNIPPELB, A., and MINOUX, M., “Exact solution of multicommodity network optimization problems with general step cost functions,” *Operations Research Letters*, vol. 25, pp. 15–23, Aug 1999.
- [125] GALIL, Z. and MARGALIT, O., “All pairs shortest distances for graphs with small integer length edges,” *Information and Computation*, vol. 134, pp. 103–139, May 1997.
- [126] GALIL, Z. and MARGALIT, O., “All pairs shortest paths for graphs with small integer length edges,” *Journal of Computer and System Sciences*, vol. 54, pp. 243–254, April 1997.
- [127] GALLO, G. and PALLOTTINO, S., “A new algorithm to find the shortest paths between all pairs of nodes,” *Discrete Applied Mathematics*, vol. 4, no. 1, pp. 23–35, 1982.
- [128] GARG, N. and KÖNEMANN, J., “Faster and simpler algorithms for multicommodity flow and other fractional packing problems,” in *39th Annual Symposium on Foundations of Computer Science: proceedings: November 8–11, 1998, Palo Alto, California* (IEEE, ed.), (1109 Spring Street, Suite 300, Silver Spring, MD 20910, USA), pp. 300–309, IEEE Computer Society Press, 1998.
- [129] GENDRON, B. and CRAINIC, T., “A parallel branch-and-bound algorithm for multi-commodity location with balancing requirements,” *Computers & Operations Research*, vol. 24, no. 9, pp. 829–847, 1997.
- [130] GENDRON, B., CRAINIC, T., and FRANGIONI, A., “Multicommodity capacitated network design,” in *Telecommunications network planning* (SORIANO, P. and SANSÒ, B., eds.), Boston: Kluwer Academic Publisher, 1999.

- [131] GEOFFRION, A., "Primal resource-directive approaches for optimizing nonlinear decomposable systems," *Operations Research*, vol. 18, pp. 375–403, 1970.
- [132] GEOFFRION, A. and GRAVES, G., "Multicommodity distribution system design by benders decomposition," *Management Science*, vol. 20, no. 5, pp. 822–844, 1974.
- [133] GIRARD, A. and SANSÒ, B., "Multicommodity flow models, failure propagation, and reliable loss network design," *IEEE/ACM Transactions on Networking*, vol. 6, pp. 82–93, Feb 1998.
- [134] GLOVER, F., GLOVER, R., and KLINGMAN, D., "Computational study of an improved shortest path algorithm," *Networks*, vol. 14, no. 1, pp. 25–36, 1984.
- [135] GLOVER, F., KLINGMAN, D., and PHILLIPS, N., "A new polynomially bounded shortest paths algorithm," *Operations Research*, vol. 33, no. 1, pp. 65–73, 1985.
- [136] GOFFIN, J.-L. and HAURIE, A. and VIAL, J.-P., "Decomposition and nondifferentiable optimization with the projective algorithm," *Management Science*, vol. 38, pp. 284–302, Feb 1992.
- [137] GOFFIN, J.-L., GONDZIO, J., SARKISSIAN, R., and VIAL, J.-P., "Solving nonlinear multicommodity flow problems by the analytic center cutting plane method," *Mathematical Programming*, vol. 76, no. 1, Ser.B, pp. 131–154, 1997.
- [138] GOLDBERG, A., "A natural randomization strategy for multicommodity flow and related algorithms," *Information Processing Letters*, vol. 42, no. 5, pp. 249–256, 1992.
- [139] GOLDBERG, A., OLDHAM, J., PLOTKIN, S., and STEIN, C., "An implementation of a combinatorial approximation algorithm for minimum-cost multicommodity flow," in *Integer programming and combinatorial optimization, Proceedings of the 6th International Conference (IPCO VI) held in Houston, TX, 1998* (BIXBY, R., BOYD, E., and RÍOS-MERCADO, R., eds.), pp. 338–352, Berlin: Springer, 1998.
- [140] GOLDBERG, A. and RADZIK, T., "A heuristic improvement of the bellman-ford algorithm," *Applied Mathematics Letters*, vol. 6, no. 3, pp. 3–6, 1993.
- [141] GOLDBERG, A. and TARJAN, R., "A new approach to the maximum-flow problem," *Journal of the ACM*, vol. 35, no. 4, pp. 921–940, 1988.
- [142] GOLDBERG, A. and TARJAN, R., "Finding minimum-cost circulations by canceling negative cycles," *Journal of the Association for Computing Machinery*, vol. 36, no. 4, pp. 873–886, 1989.
- [143] GOLDBERG, A. and TARJAN, R., "Solving minimum-cost flow problems by successive approximation," *Mathematics of Operations Research*, vol. 15, no. 3, pp. 430–466, 1990.
- [144] GOLDEN, B., "A minimum-cost multicommodity network flow problem concerning imports and exports," *Networks*, vol. 5, pp. 331–356, Oct 1975.
- [145] GOLDFARB, D., HAO, J., and KAI, S., "Efficient shortest path simplex algorithms," *Operations Research*, vol. 38, no. 4, pp. 624–628, 1990.

- [146] GOLDFARB, D., HAO, J., and KAI, S., “Shortest path algorithms using dynamic breadth-first search,” *Networks*, vol. 21, no. 1, pp. 29–50, 1991.
- [147] GOLDFARB, D. and IDNANI, A., “A numerically stable dual method for solving strictly convex quadratic programs,” *Mathematical Programming*, vol. 27, pp. 1–33, Sep 1983.
- [148] GOLDFARB, D. and JIN, Z., “An  $o(nm)$ -time network simplex algorithm for the shortest path problem,” *Operations Research*, vol. 47, no. 3, pp. 445–448, 1999.
- [149] GOPALAKRISHNAN, B., *Least-Squares Methods in Linear Programming*. PhD thesis, School of Industrial and Systems Engineering, Georgia Institute of Technology, 2002.
- [150] GOTO, S., OHTSUKI, T., and YOSHIMURA, T., “Sparse matrix techniques for the shortest path problem,” *IEEE Transactions on Circuits and Systems*, vol. CAS-23, pp. 752–758, Dec 1976.
- [151] GOTO, S. and SANGIOVANNI-VINCENTELLI, A., “A new shortest path updating algorithm,” *Networks*, vol. 8, no. 4, pp. 341–372, 1978.
- [152] GOUVEIA, L., “Multicommodity flow models for spanning trees with hop constraints,” *European Journal of Operational Research*, vol. 95, no. 1, pp. 178–190, 1996.
- [153] GRATZER, F. and STEIGLITZ, K., “A heuristic approach to large multicommodity flow problems,” in *22nd international symposium on computer-communications networks and teletraffic*, pp. 311–324, 1972.
- [154] GRAVES, G. and MCBRIDE, R., “The factorization approach to large-scale linear programming,” *Mathematical Programming*, vol. 10, no. 1, pp. 91–110, 1976.
- [155] GRIGORIADIS, M. D. and WHITE, W. W., “Computational experience with a multi-commodity network flow algorithm,” in *Optimization methods for resource allocation (Proc. NATO Conf., Elsinore)* (COTTLE, R. and KRARUP, J., eds.), pp. 205–226, English Univsity Press, London, 1972.
- [156] GRIGORIADIS, M. D. and WHITE, W. W., “A partitioning algorithm for the multi-commodity network flow problem,” *Mathematical Programming*, vol. 3, no. 3, pp. 157–177, 1972.
- [157] GRIGORIADIS, M. and KHACHIYAN, L., “Fast approximation schemes for convex programs with many blocks and coupling constraints,” *SIAM Journal on Optimization*, vol. 4, no. 1, pp. 86–107, 1994.
- [158] GRIGORIADIS, M. and KHACHIYAN, L., “An exponential-function reduction method for block-angular convex programs,” *Networks*, vol. 26, no. 2, pp. 59–68, 1995.
- [159] GRIGORIADIS, M. and KHACHIYAN, L., “Approximate minimum-cost multicommodity flows in  $\tilde{O}(\epsilon^{-2}KNM)$  time,” *Mathematical Programming*, vol. 75, no. 3, Ser. A, pp. 477–482, 1996.
- [160] GRIGORIADIS, M. and KHACHIYAN, L., “Coordination complexity of parallel price-directive decomposition,” *Mathematics of Operations Research*, vol. 21, no. 2, pp. 321–340, 1996.

- [161] GRINOLD, R., "Steepest ascent for large scale linear programs," *SIAM Review*, vol. 14, no. 3, pp. 447–464, 1972.
- [162] GRÖTSCHEL, M., LOVÁSZ, L., and SCHRIJVER, A., *Geometric algorithms and combinatorial optimization*. Berlin: Springer-Verlag, second ed., 1993.
- [163] HADJIAT, M., MAURRAS, J.-F., and VAXÈS, Y., "A primal partitioning approach for single and non-simultaneous multicommodity flow problems," *European Journal of Operational Research*, vol. 123, pp. 382–393, Jun 2000.
- [164] HAGHANI, A. and OH, S.-C., "Formulation and solution of a multi-commodity, multimodal network flow model for disaster relief operations," *Transportation research. Part A, Policy and practice.*, vol. 30A, pp. 231–250, May 1996.
- [165] HANE, C., "Personal communication," 2001.
- [166] HANE, C., BARNHART, C., JOHNSON, E., MARSTEN, R., NEMHAUSER, G., and SIGISMONDI, G., "The fleet assignment problem: solving a large-scale integer program," *Mathematical Programming*, vol. 70, pp. 211–232, 1995.
- [167] HARTMAN, J. and LASDON, L., "A generalized upper bounding algorithm for multi-commodity network flow problems," *Networks*, vol. 1, no. 4, pp. 333–354, 1972.
- [168] HELD, M., WOLFE, P., and CROWDER, H., "Validation of subgradient optimization," *Mathematical Programming*, vol. 6, no. 1, pp. 62–88, 1974.
- [169] HU, J. and JOHNSON, E., "Computational results with a primal-dual subproblem simplex method," *Operations Research Letters*, vol. 25, pp. 149–157, 1999.
- [170] HU, T., "Multi-commodity network flows," *Operations Research*, vol. 11, pp. 344–360, 1963.
- [171] HU, T., "Revised matrix algorithms for shortest paths," *SIAM Journal of Applied Mathematics*, vol. 15, pp. 207–218, January 1967.
- [172] HU, T., "A decomposition algorithm for shortest paths in a network," *Operations Research*, vol. 16, pp. 91–102, 1968.
- [173] HUNG, M. and DIVOKY, J., "A computational study of efficient shortest path algorithms," *Computers and Operations Research*, vol. 15, no. 6, pp. 567–576, 1988.
- [174] IATA, *Air Cargo Annual, A Statistical Overview of the Market in 1998*. IATA, 1999.
- [175] IATA, *Asia Pacific Air Transport Forecast 1980-2010*. IATA, 1999.
- [176] IATA, *Freight Forecast 1999-2003*. IATA, 1999.
- [177] IATA, *World Air Transport Statistics*. IATA, 1999.
- [178] IBARAKI, S., FUJISHIMA, M., and IBARAKI, T., "Primal-dual proximal point algorithm for linearly constrained convex programming problems," *Computational Optimization and Applications*, vol. 1, no. 2, pp. 207–226, 1992.

- [179] IBARAKI, S. and FUKUSHIMA, M., “Primal-dual proximal point algorithm for multicommodity network flow problems,” *Journal of the Operations Research Society of Japan*, vol. 37, pp. 297–309, Dec 1994.
- [180] JEWELL, W., “Warehousing and distribution of a seasonal product,” *Naval Research Logistics Quarterly*, vol. 4, no. 4, pp. 29–34, 1957.
- [181] JEWELL, W., *Optimal flow through networks*. PhD thesis, Interim Tech. Report No. 8, OR Center, M.I.T., Cambridge, MA, Jun 1958.
- [182] JEWELL, W., “A primal-dual multicommodity flow algorithm,” Tech. Rep. ORC 66-24, Operations Research Center, University of California, Berkeley, 1966.
- [183] JOHNSON, D., “Efficient algorithms for shortest paths in sparse networks,” *Journal of ACM*, vol. 24, no. 1, pp. 1–13, 1977.
- [184] JOHNSON, D., “A priority queue in which initialization and queue operations take  $o(\log \log d)$  time,” *Mathematical Systems Theory*, vol. 15, no. 4, pp. 295–309, 1982.
- [185] JOHNSON, D. and MCGEOCH, C., *Network Flows and Matching: First DIMACS Implementation Challenge*. AMS, Providence, 1993.
- [186] JOHNSON, E., “On shortest paths and sorting,” in *Proceedings of the ACM 25th annual conference*, pp. 510–517, 1972.
- [187] JONES, K., LUSTIG, I., FARVOLDEN, J., and POWELL, W., “Multicommodity network flows: the impact of formulation on decomposition,” *Mathematical Programming*, vol. 62, no. 1, pp. 95–117, 1993.
- [188] KALLIO, M. and RUSZCZYŃSKI, A., “Parallel solution of linear programs via nash equilibria,” tech. rep., WP-94-015, IIASA, Laxenburg, Austria, March 1994.
- [189] KAMATH, A. and PALMON, O., “Improved interior point algorithms for exact and approximate solution of multicommodity flow problems,” in *Proceedings of the sixth annual ACM-SIAM Symposium on Discrete Algorithms (San Francisco, CA, 1995)*, pp. 502–511, ACM, SIAM, ACM, SIAM, 1995.
- [190] KAMATH, A., PALMON, O., and PLOTKIN, S., “Fast approximation algorithm for minimum cost multicommodity flow,” in *Proceedings of the sixth annual ACM-SIAM symposium on Discrete algorithms*, (New York, NY, USA), pp. 493–501, ACM Press, 1995.
- [191] KAPOOR, S. and VAIDYA, P., “Speeding up karmarkar’s algorithm for multicommodity flows,” *Mathematical Programming*, vol. 73, no. 1, Ser. A, pp. 111–127, 1996.
- [192] KARGER, D. and PLOTKIN, S., “Adding multiple cost constraints to combinatorial optimization problems, with applications to multicommodity flows,” in *Proceedings of the Twenty-Seventh Annual ACM Symposium on the Theory of Computing*, (New York, NY, USA), pp. 18–25, ACM, ACM Press, 1995.
- [193] KARMARKAR, N., “A new polynomial-time algorithm for linear programming,” *Combinatorica*, vol. 4, no. 4, pp. 373–395, 1984.

- [194] KARP, R., "On the computational complexity of combinatorial problems," *Networks*, vol. 5, no. 1, pp. 45–68, 1975.
- [195] KARYPIS, G. and KUMAR, V., "Metis, a software package for partitioning unstructured graphs, partitioning meshes, and computing fill-reducing orderings of sparse matrices." <http://www-users.cs.umn.edu/~karypis/metis/metis/download.html>, 1998.
- [196] KARYPIS, G. and KUMAR, V., "A fast and high quality multilevel scheme for partitioning irregular graphs," *SIAM Journal on Scientific Computing*, vol. 20, no. 1, pp. 359–392, 1999.
- [197] KAZANOV, A., "Minimum cost multiflows in undirected networks," *Mathematical Programming*, vol. 66, no. 3, Ser. A, pp. 313–325, 1994.
- [198] KAZANOV, A., "Multiflows and disjoint paths of minimum total cost," *Mathematical Programming*, vol. 78, no. 2, Ser. B, pp. 219–242, 1997.
- [199] KENNINGTON, J. and SHALABY, M., "An effective subgradient procedure for minimal cost multicommodity flow problems," *Management science*, vol. 23, pp. 994–1004, May 1977.
- [200] KENNINGTON, J., "Solving multicommodity transportation problems using a primal partitioning simplex technique," *Naval Research Logistics Quarterly*, vol. 24, pp. 309–325, Jun 1977.
- [201] KENNINGTON, J., "A survey of linear cost multicommodity network flows," *Operations Research*, vol. 26, no. 2, pp. 209–236, 1978.
- [202] KENNINGTON, J. and HELGASON, R., *Algorithms for Network Programming*. New York: Wiley-Interscience, 1980.
- [203] KERSHENBAUM, A., "A note on finding shortest paths trees," *Networks*, vol. 11, no. 4, pp. 399–400, 1981.
- [204] KLEIN, P., AGRAWAL, A., RAVI, R., and RAO, S., "Approximation through multicommodity flow," in *Proceedings of the 31th annual IEEE Symposium on Foundations of Computer Science*, vol. 2, pp. 726–737, IEEE, 1990.
- [205] KLEIN, P., PLOTKIN, S., STEIN, C., and TARDOS, É., "Faster approximation algorithms for the unit capacity concurrent flow problem with applications to routing and finding sparse cuts," *SIAM Journal on Computing*, vol. 23, no. 3, pp. 466–487, 1994.
- [206] KLEIN, P., RAO, S., AGRAWAL, A., and RAVI, R., "An approximate max-flow min-cut relation for undirected multicommodity flow, with applications," *Combinatorica*, vol. 15, no. 2, pp. 187–202, 1995.
- [207] KLINGMAN, D., NAPIER, A., and STUTZ, J., "Netgen: a program for generating large scale capacitated assignment, transportation and minimum cost flow network problems," *Management Science*, vol. 20, pp. 814–821, Jan 1974.
- [208] KÖNEMANN, J., "Faster and simpler algorithms for multicommodity flow and other fractional packing problems," Master's thesis, Computer Science, Universität des Saarlandes, Saarbrücken, Germany, 1998.

- [209] KONTOGIORGIS, S., *Alternating directions methods for the parallel solution of large-scale block-structured optimization problems*. PhD thesis, Computer Science, University of Wisconsin-Madison, 1995.
- [210] KWON, O., MARTLAND, C., and SUSSMAN, J., "Routing and scheduling temporal and heterogeneous freight car traffic on rail networks," *Transportation Research Part E: Logistics and Transportation Review*, vol. 34, pp. 101–115, Jun 1998.
- [211] LAND, A. and STAIRS, S., "The extension of the cascade algorithm to large graphs," *Management Science*, vol. 14, pp. 29–33, 1967.
- [212] LARSEN, J. and PEDERSEN, I., "Experiments with the auction algorithm for the shortest path problem," *Nordic Journal of Computing*, vol. 6, no. 4, pp. 403–421, 1999.
- [213] LASDON, S., *Optimization theory for large systems*. New York: MacMillan, 1970.
- [214] LAWSON, C. and HANSON, R., *Solving Least-Squares Problems*. Englewood Cliffs, N.J.: Prentice-Hall, 1974.
- [215] LEBLANC, L., MORLOK, E., and PIERSKALLA, W., "An efficient approach to solving the road network equilibrium traffic assignment problem," *Transportation Research*, vol. 9, pp. 309–318, Oct 1975.
- [216] LEICHNER, S., DANTZIG, G., and DAVIS, J., "A strictly improving linear programming phase i algorithm," *Annals of Operations Research*, vol. 46–47, pp. 409–430, Dec 1993.
- [217] LEIGHTON, F. and RAO, S., "An approximate max-flow min-cut theorem for uniform multicommodity flow problems with applications to approximation algorithms," in *Proceedings of the 29th annual IEEE Symposium on Foundations of Computer Science*, pp. 422–431, IEEE, 1988.
- [218] LEIGHTON, T., MAKEDON, F., PLOTKIN, S., STEIN, C., TARDOS, É., and TRAGOUDAS, S., "Fast approximation algorithms for multicommodity flow problems," *Journal of Computer and System Sciences*, vol. 50, pp. 228–243, Apr 1995.
- [219] LEIGHTON, T. and RAO, S., "Multicommodity max-flow min-cut theorems and their use in designing approximation algorithms," *Journal of the ACM*, vol. 46, pp. 787–832, Nov 1999.
- [220] LEVIT, B. and LIVSHITS, B., "Neleneinye setevye transportnye zadachi," *Transport*, p. in Russian, 1992.
- [221] LIN, F. and YEE, J., "A new multiplier adjustment procedure for the distributed computation of routing assignments in virtual circuit data networks," *ORSA Journal on Computing*, vol. 4, no. 3, pp. 250–266, 1992.
- [222] LIN, S.-Y. and LIN, C. H., "A computationally efficient method for nonlinear multicommodity network flow," *Networks*, vol. 29, no. 4, pp. 225–244, 1997.
- [223] LIU, J. W., "Modification of the minimum degree algorithm by multiple elimination," *ACM Trans. Math. Software*, vol. 11, pp. 141–153, 1985.

- [224] LOMONOSOV, M., "Combinatorial approaches to multiflow problems," *Discrete Applied Mathematics*, vol. 11, no. 1, pp. 1–93, 1985.
- [225] LUSTIG, I. and ROTHBERG, E., "Gigaflops in linear programming," *Operations Research Letters*, vol. 18, pp. 157–165, Feb 1996.
- [226] LUSTIG, I.J. AND MARSTEN, R. and SHANNO, D., "Computational experience with a primal-dual interior point method for linear programming," *Linear Algebra and its Applications*, vol. 152, pp. 191–222, 1991.
- [227] MAHEY, P., OUOROU, A., LEBLANC, L., and CHIFFLET, J., "A new proximal decomposition algorithm for routing in telecommunication networks," *Networks*, vol. 31, pp. 227–238, Jul 1998.
- [228] MAIER, S., "A compact inverse scheme applied to a multicommodity network with resource constraints," in *Optimization methods for resource allocation (Proc. NATO Conf., Elsinore)* (COTTLE, R. and KRARUP, J., eds.), pp. 179–203, English Univsity Press, London, 1972.
- [229] MAMER, J. and MCBRIDE, R., "A decomposition-based pricing procedure for large-scale linear programs: an application to the linear multicommodity flow problem," *Management Science*, vol. 46, pp. 693–709, May 2000.
- [230] MARKOWITZ, H., "The elimination form of the inverse and its application to linear programming," *Management Science*, vol. 3, pp. 255–269, April 1957.
- [231] MARSTEN, R., SUBRAMANIAN, R., SALTZMAN, M., LUSTIG, I., and SHANNO, D., "Interior point methods for linear programming: just call newton, lagrange, and fiacco and mccormick!," *Interfaces*, vol. 20, no. 4, pp. 105–116, 1990.
- [232] MAURRAS, J.-F. and VAXÈS, Y., "Multicommodity network flow with jump constraints," *Discrete Mathematics*, vol. 165–166, pp. 481–486, 1997.
- [233] MCBRIDE, R., "Solving embedded generalized network problems," *European Journal of Operational Research*, vol. 21, no. 1, pp. 82–92, 1985.
- [234] MCBRIDE, R., "Advances in solving the multicommodity-flow problem," *Interfaces*, vol. 28, no. 2, pp. 32–41, 1998.
- [235] MCBRIDE, R., "Progress made in solving the multicommodity flow problem," *SIAM Journal on Optimization*, vol. 8, pp. 947–955, Nov. 1998.
- [236] MCBRIDE, R. and MAMER, J., "Solving multicommodity flow problems with a primal embedded network simplex algorithm," *INFORMS Journal on Computing*, vol. 9, no. 2, pp. 154–163, 1997.
- [237] MCBRIDE, R. and MAMER, J., "Solving the undirected multicommodity flow problem using a shortest path-based pricing algorithm," *Networks*, vol. 38, pp. 181–188, Dec. 2001.
- [238] MCCALLUM, C.J., J., "A generalized upper bounding approach to a communications network planning problem," *Networks*, vol. 7, no. 1, pp. 1–23, 1977.



- [239] MEYER, R. and ZAKERI, G., "Multicoordination methods for solving convex block-angular programs," *SIAM Journal on Optimization*, vol. 10, no. 1, pp. 121–131, 1999.
- [240] MILLS, G., "A decomposition algorithm for the shortest-route problem," *Operations Research*, vol. 14, pp. 279–291, 1966.
- [241] MONDOU, J., CRAINIC, T., and NGUYEN, S., "Shortest path algorithms: a computational study with the c programming language," *Computers and Operations Research*, vol. 18, pp. 767–786, 1991.
- [242] MONTEIRO, D. and ADLER, I., "Interior path following primal-dual algorithms. part i: Linear programming.," *Mathematical Programming*, vol. 44, no. 1, Ser. A, pp. 27–41, 1989.
- [243] MOORE, E., "The shortest path through a maze," in *Proceedings of the International Symposium on theory of Switching , Part II*, pp. 285–292, The Annals of the Computation Laboratory of Harvard University, 1957.
- [244] MORRIS, J., "An escalator process for the solution of linear simultaneous equations," *Philos. Mag. (7)*, vol. 37, pp. 106–120, 1946.
- [245] MURRAY, S., *An interior point approach to the generalized flow problem with costs and related problems*. PhD thesis, Department of Operations Research, Stanford University, Aug 1992.
- [246] MURTAGH, B. and SAUNDERS, M., "Large-scale linearly constrained optimization," *Mathematical Programming*, vol. 14, no. 1, pp. 41–72, 1978.
- [247] MURTAGH, B. and SAUNDERS, M., "Minos 5.4 release notes, appendix to minos 5.1 user's guide," tech. rep., Stanford University, 1992.
- [248] MUTHUKRISHNAN, S. and SUEL, T., "Second-order methods for distributed approximate single- and multicommodity flow," in *Randomization and Approximation Techniques in Computer Science. Second International Workshop, RANDOM'98. Proceedings* (LUBY, M., ROLIM, J., and SERNA, M., eds.), vol. 1518, (Berlin), pp. 369–383, Springer, 1998.
- [249] NAGAMOCHI, H., FUKUSHIMA, M., and IBARAKI, T., "Relaxation methods for the strictly convex multicommodity flow problem with capacity constraints on individual commodities," *Networks*, vol. 20, pp. 409–426, Jul 1990.
- [250] NAGAMOCHI, H. and IBARAKI, T., "On max-flow min-cut and integral flow properties for multicommodity flows in directed networks," *Information Processing Letters*, vol. 31, pp. 279–285, Jun 1989.
- [251] NAKAMORI, M., "A note on the optimality of some all-shortest-path algorithms," *Journal of the Operations Research Society of Japan*, vol. 15, pp. 201–204, December 1972.
- [252] NEMHAUSER, G., "A generalized permanent label setting algorithm for the shortest path between specified nodes," *Journal of Mathematical Analysis and Applications*, vol. 38, pp. 328–334, 1972.

- [253] NGUYEN, S., PALLOTTINO, S., and SCUTELLÀ, M., “A new dual algorithm for shortest path reoptimization,” in *Transportation and Network Analysis - Current Trends* (GENDREAU, M. and MARCOTTE, P., eds.), Kluwer Academic Publishers, 2001.
- [254] OKAMURA, H., “Multicommodity flows in graphs,” *Discrete Applied Mathematics*, vol. 6, pp. 55–62, May 1983.
- [255] OKAMURA, H. and SEYMOUR, P., “Multicommodity flows in planar graphs,” *Journal of Combinatorial Theory*, vol. 31, no. 1, Ser. B, pp. 75–81, 1981.
- [256] OLDHAM, J., *Multicommodity and generalized flow algorithms: theory and practice*. PhD thesis, Department of Computer Science, Stanford University, 1999.
- [257] OUOROU, A., “A primal-dual algorithm for monotropic programming and its application to network optimization,” *Computational Optimization and Applications*, vol. 15, pp. 125–143, Feb 2000.
- [258] OUOROU, A. and MAHEY, P., “A minimum mean cycle cancelling method for non-linear multicommodity flow problems,” *European Journal of Operational Research*, vol. 121, pp. 532–548, Mar 2000.
- [259] OUOROU, A., MAHEY, P., and VIAL, J.-P., “A survey of algorithms for convex multicommodity flow problems,” *Management Science*, vol. 46, pp. 126–147, Jan 2000.
- [260] PALLOTTINO, S., “Shortest-path methods: complexity, interrelations and new propositions,” *Networks*, vol. 14, pp. 257–267, 1984.
- [261] PALLOTTINO, S. and SCUTELLÀ, M., “Dual algorithms for the shortest path tree problem,” *Networks*, vol. 29, no. 2, pp. 125–133, 1997.
- [262] PALMON, O., *Optimization issues in network routing*. PhD thesis, Department of Computer Science, Stanford University, Jun 2001.
- [263] PAPADIMITRIOU, C. and STEIGLITZ, K., *Combinatorial optimization: algorithms and complexity*. Englewood Cliffs, NJ: Prentice-Hall, 1982.
- [264] PAPE, U., “Implementation and efficiency of moore algorithms for the shortest root problem,” *Mathematical Programming*, vol. 7, pp. 212–222, 1974.
- [265] PETTIE, S. and RAMACHANDRAN, V., “Computing shortest paths with comparisons and additions,” utcs tr-01-12, Department of Computer Science, The University of Texas at Austin, 2001.
- [266] PINAR, M. and ZENIOS, S., “Parallel decomposition of multicommodity network flows using a linear-quadratic penalty algorithm,” *ORSA Journal on Computing*, vol. 4, no. 3, pp. 235–249, 1992.
- [267] PLOTKIN, S., SHMOYS, D., and TARDOS, É., “Fast approximation algorithms for fractional packing and covering problems,” *Mathematics of Operations Research*, vol. 20, pp. 257–301, May 1995.
- [268] POLAK, G., “On a parametric shortest path problem from primal-dual multicommodity network optimization,” *Networks*, vol. 22, pp. 283–295, May 1992.

- [269] RADZIK, T., “Fast deterministic approximation for the multicommodity flow problem,” *Mathematical Programming*, vol. 78, no. 1, Ser. A, pp. 43–58, 1995.
- [270] RAGHAVAN, P., “Integer programming in vlsi design,” *Discrete Applied Mathematics*, vol. 40, pp. 29–43, Nov 1992.
- [271] ROCKAFELLAR, R., *Network flows and monotropic optimization*. New York, NY: John Wiley, 1984.
- [272] ROSE, D. and TARJAN, R., “Algorithmic aspects of vertex elimination on directed graphs,” *SIAM Journal on Applied Mathematics*, vol. 34, no. 1, pp. 176–197, 1978.
- [273] ROSEN, J., “Primal partition programming for block diagonal matrices,” *Numerische Mathematik*, vol. 6, pp. 250–260, 1964.
- [274] ROTE, G., “A systolic array algorithm for the algebraic path problem,” *Computing*, vol. 34, no. 3, pp. 191–219, 1985.
- [275] ROTE, G., “Path problems in graphs,” in *Computational graph theory*, pp. 155–189, Vienna: Springer, 1990.
- [276] ROTHSCILD, B. and WHINSTON, A., “On two commodity network flows,” *Operations Research*, vol. 14, pp. 377–387, 1966.
- [277] SAIGAL, R., “Multicommodity flows in directed networks,” Tech. Rep. ORC Report 66-25, Operations Research Center, University of California, Berkeley, 1967.
- [278] SAKAROVITCH, M., “Two commodity network flows and linear programming,” *Mathematical Programming*, vol. 4, no. 1, pp. 1–20, 1973.
- [279] SARRAFZADEH, M. and WONG, C., *An introduction to VLSI physical design*. New York: McGraw Hill, 1996.
- [280] SCHNEUR, R., *Scaling algorithms for multicommodity flow problems and network flow problems with side constraints*. PhD thesis, M.I.T., Cambridge, MA, 1991.
- [281] SCHNEUR, R. and ORLIN, J., “A scaling algorithm for multicommodity flow problems,” *Operations Research*, vol. 146, no. 2, pp. 231–246, 1998.
- [282] SCHRIJVER, A., “Short proofs on multicommodity flows and cuts,” *Journal of Combinatorial Theory*, vol. 53, no. 1, Ser. B, pp. 32–39, 1991.
- [283] SCHULTZ, G. and MEYER, R., “An interior point method for block angular optimization,” *SIAM Journal on Optimization*, vol. 1, no. 4, pp. 583–602, 1991.
- [284] SEIDEL, R., “On the all-pairs-shortest-path problem in unweighted undirected graphs,” *Journal of Computer and System Sciences*, vol. 51, pp. 400–403, December 1995.
- [285] SENSEN, N., “Lower bounds and exact algorithms for the graph partitioning problem using multicommodity flows,” in *Algorithms-ESA 2001 : 9th annual European symposium, Aarhus, Denmark, August 28-31, 2001 : proceedings* (AUF DER HEIDE, F. M., ed.), vol. 2161, (Berlin Heidelberg), pp. 391–403, Springer, Aug 2001.

- [286] SEYMOUR, P., "Matroids and multicommodity flows," *European Journal of Combinatorics*, vol. 2, no. 3, pp. 257–290, 1981.
- [287] SHAHROKHI, F. and MATULA, D., "The maximum concurrent flow problem," *Journal of the ACM*, vol. 37, pp. 318–334, Apr 1990.
- [288] SHEPHERD, B. and ZHANG, L., "A cycle augmentation algorithm for minimum cost multicommodity flows on a ring," *Discrete Applied Mathematics*, vol. 110, no. 2-3, pp. 301–315, 2001.
- [289] SHETTY, B. and MUTHUKRISHNAN, R., "A parallel projection for the multicommodity network model," *Journal of the Operational Research Society*, vol. 41, pp. 837–842, Sep 1990.
- [290] SHIER, D. and WITZGALL, C., "Properties of labeling methods for determining shortest paths trees," *Journal of Research of the National Bureau of Standards*, vol. 86, no. 3, pp. 317–330, 1981.
- [291] SHIMBEL, A., "Applications of matrix algebra to communication nets," *Bulletin of Mathematical Biophysics*, vol. 13, pp. 165–178, 1951.
- [292] SOUN, Y. and TRUEMPER, K., "Single commodity representation of multicommodity networks," *SIAM Journal on Algebraic and Discrete Methods*, vol. 1, no. 3, pp. 348–358, 1980.
- [293] TAKAOKA, T., "A new upper bound on the complexity of the all pairs shortest path problem," *Information Processing Letters*, vol. 43, no. 4, pp. 195–199, 1992.
- [294] TAKAOKA, T., "Subcubic cost algorithms for the all pairs shortest path problem," *Algorithmica*, vol. 20, no. 3, pp. 309–318, 1998.
- [295] THORUP, M., "Undirected single-source shortest paths with positive integer weights in linear time," *Journal of ACM*, vol. 46, no. 3, pp. 362–394, 1999.
- [296] THORUP, M., "Floats, integers, and single source shortest paths," *Journal of Algorithms*, vol. 35, no. 2, pp. 189–201, 2000.
- [297] TOMLIN, J., "Minimum-cost multicommodity network flows," *Operations Research*, vol. 14, no. 1, pp. 45–51, 1966.
- [298] TRUEMPER, K., "Unimodular matrices of flow problems with additional constraints," *Networks*, vol. 7, no. 4, pp. 343–358, 1977.
- [299] TRUEMPER, K. and SOUN, Y., "Minimal forbidden subgraphs of unimodular multicommodity networks," *Mathematics of Operations Research*, vol. 4, no. 4, pp. 379–389, 1979.
- [300] VAIDYA, P., "Speeding-up linear programming using fast matrix multiplication," in *30th Annual Symposium on Foundations of Computer Science*, pp. 332–337, IEEE, 1989.
- [301] VAN DE PANNE, C. and WHINSTON, A., "The symmetric foundation of the simplex method for quadratic programming," *Econometrica*, vol. 37, pp. 507–527, 1969.

- [302] VANCE, P., BARNHART, C., JOHNSON, E., and NEMHAUSER, G., "Solving binary cutting stock problems by column generation and branch-and-bound," *Computational Optimization and Applications*, vol. 3, no. 2, pp. 111–130, 1994.
- [303] WARDROP, J., "Some theoretical aspects of road traffic research," in *Proceeding of the Institute of Civil Engineers, Part II*, vol. 1, pp. 325–378, 1952.
- [304] WARSHALL, S., "A theorem on boolean matrices," *Journal of ACM*, vol. 9, pp. 11–12, 1962.
- [305] YAMAKAWA, E., MATSUBARA, Y., and FUKUSHIMA, M., "A parallel primal-dual interior point method for multicommodity flow problems with quadratic costs," *Journal of the Operations Research Society of Japan*, vol. 39, pp. 566–591, Dec 1996.
- [306] YANG, L. and CHEN, W., "An extension of the revised matrix algorithm," in *IEEE international Symposium on Circuits and Systems*, (Portland, Oregon), pp. 1996–1999, IEEE, May 1989.
- [307] YE, Y., "Toward probabilistic analysis of interior-point algorithms for linear programming," *Mathematics of Operations Research*, vol. 19, no. 1, pp. 38–52, 1994.
- [308] YEN, J., "An algorithm for finding shortest routes from all source nodes to a given destination in general networks," *Quarterly of Applied Mathematics*, vol. 27, pp. 526–530, 1970.
- [309] YOUNG, N., "Randomized rounding without solving the linear program," in *Proceedings of the sixth annual ACM-SIAM symposium on Discrete algorithms*, (New York, NY, USA), pp. 170–178, ACM Press, 1995.
- [310] ZAKERI, G., *Multi-coordination methods for parallel solution of block-angular programs*. PhD thesis, Computer Science, University of Wisconsin, May 1995.
- [311] ZENIOS, S., PINAR, M., and DEMBO, R., "A smooth penalty function algorithm for network-structured problems," *European Journal of Operational Research*, vol. 83, pp. 229–236, May 1995.
- [312] ZHAN, F. and NOON, C., "Shortest path algorithms: an evaluation using real road networks," *Transportation Science*, vol. 32, pp. 65–73, February 1998.
- [313] ZWICK, U., "All pairs shortest paths in weighted directed graphs - exact and almost exact algorithms," in *Proceedings of the 39th Annual IEEE Symposium on Foundations of Computer Science*, (Palo Alto, California), pp. 310–319, November 1998.