Computational tests on the decomposition algorithm for the transportation problem

© A.A. Gurchenkov[1], A.P. Tizik[2], E.V. Torchinskaya[3]

[1] Bauman Moscow State Technical University, Moscow, 105005, Russia
[2] Dorodnicyn Computing Centre of RAS, Moscow, 119991, Russia
[3] Moscow Institute of Physics and Technology (State University), Dolgoprudny, Moscow Region, 141700, Russia

The article presents numerical tests of iterative method for solving transportation problem based on successive recalculations of functional coefficient. Optimal solution is achieved in three iterations and degeneration is not involved. This solution matches those obtained by standard program using method of potentials. Standard optimization methods are used. Algorithm constructs a sequence of solutions for intermediate one-dimensional problems, which are not permissible for the original problem. Monotonous functional growth at pseudosolutions takes place. Formulas of solutions of intermediate two-dimensional problems with hooked variables are composed. Coefficients of functional are successively recalculated. Finally permissible solution is searched in a set of equations. If there is no such solution the problem of maximum flow with transportation limitations is solved. Corresponding indices pairs are formed by certain rule.

Keywords: *transportation problem, decomposition, generalized suppliers and consumers.*

REFERENCES

[1] Mironov A.A., Tsurkov V.I. Approximation and Decomposition by Extremal Graphs. *Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki — Computational Mathematics and Mathematical Physics*, 1993, vol.. 33, no. 2, pp. 34–39.

[2] Mironov A.A., Tsurkov V.I. *Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki — Computational Mathematics and Mathematical Physics*, 1995, vol. 35, no. 1, pp. 141–147.

[3] Mironov A.A., Tsurkov V.I. *Izvestiya RAN.Teoriya i Sistemy Upravleniya — Proceedings of the Russian Academy of Sciences. Theory and Control Systems*, 1998, no. 6, pp. 67–73.

[4] Mironov A.A., Tsurkov V.I. Transport-type Problems With a Criterion. *Avtomatika i Telemekhanika — Automation and Remote Control*, 1995, no. 12, pp. 109–118.

[5] Mironov A.A., Tsurkov V.I. *Izvestiya RAN.Teoriya i sistemy upravleniya — Proceedings of the Russian Academy of Sciences. Theory and Control Systems*, 1998, no. 6, pp. 89–96.

[6] Mironov A.A., Tsurkov V.I. *Doklady RAN — RAS Reports*, 1996, vol. 346, no. 2, pp. 342–347.

[7] Mironov A.A., Tsurkov V.I. Network Models With Fixed Parameters in Coupling Nodes. 2. *Izvestiya RAN. Teoriya i Sistemy Upravleniya — Proceedings of the Russian Academy of Sciences. Theory and Control Systems*, 1993, no. 6, pp. 3–14.

[8] Mironov A.A., Levkina T.A., Tsurkov V.I. Minimax Estimations of Expectates of Arc Weights in Integer Networks With Fixed Node Degrees. *Applied and Computational Mathematics*, 2009, vol. 8, no. 2, pp. 216–226.

[9] Cheburakhin I.F., Tsurkov V.I. On the Complexity of Realization of Symmetric Zhegalkin Polynomials. *Applied and Computational Mathematics*, 2010, vol. 9, no. 2, pp. 198–219.

[10] Averbakh I., Lebedev V., Tsurkov V. Nash Equilibria Solutions in The Competitive Salesmen Problem on a Network. *Applied and Computational Mathematics*, 2008, vol. 7, no. 1, pp. 54–65.

[11] Mironov A.A., Tsurkov V.I. Open Transportation Models With a Minimax Criterion. *Doklady Mathematics*, 2001, vol. 64, no. 3, pp. 374–377.

[12] Mironov A.A., Tsurkov V.I. A Triplanar Transportation Problem with a Minimax Criterion. *Doklady Mathematics*, 1996, vol. 54, no. 3, pp. 972–975.

[13] Cheburakhin I.F., Tsurkov V.I. *Mekhatronika, Avtomatizatsiya, Upravlenie — Mechatronics, Automation, Control*, 2009, no 7, pp. 19–29.

[14] Cheburakhin I.F.,Tsurkov V.I. *Mekhatronika, Avtomatizatsiya, Upravlenie — Mechatronics, Automation, Control,* 2010, no. 9, pp. 7–13.

[15] Cheburakhin I.F.,Tsurkov V.I. *Mekhatronika, Avtomatizatsiya, Upravlenie — Mechatronics, Automation, Control*, 2011, no. 3, pp. 27–34.

[16] Tsurkov V. Aggregation in a Branch Manufacturing Problem and its Extension. *Proc. 13th IFAC Symp. Information Control Problems in Manufacturing*, Moscow, 2009, pp. 310–312.

[17] Tizik A.P., Tsurkov V.I. *Avtomatika i Telemekhanika — Automation and Remote Control*, 2012, no. 1, pp. 148–158.

[18] Sokolov A.A., Tizik A.P., Tsurkov V.I. *Izvestiya RAN.Teoriya i sistemy upravleniya — Proceedings of the Russian Academy of Sciences. Theory and Control Systems*, 2013, no. 4, pp. 88–98.

[19] http://math.semestr.ru/transp/index.php

Gurchenkov A.A. (b. 1939**)**, Dr. Sci. (Phis. & Math.), Professor of the Higher Mathematics Department of Bauman Moscow State Technical University. He is the author of about 130 publications in the field of applied mathematics and mechanics, including 8 monographs. Scientific interests in modelling and control of fluid-containing rotating rigid bodies. e-mail: challenge2005@mail.ru

Tizik A.P. (b. 1942) graduated from Lomonosov Moscow State University in 1965. Ph.D. (Phys.&Math.), Senior Researcher at Dorodnicyn Computing Centre of RAS. Scientific interests in operations research, discrete programming, transportation problems, decomposition of large-scale problems. e-mail: tizik_ap@mail.ru

Torchinskaya E.V. (b. 1990) is a postgraduate at Moscow Institute of Physics and Technology (State University). Scientific interests in optimization, decomposition of large-scale problems.