WEIGHTED MATRIX STRUCTURAL ADJUSTMENT IMPROPER LINEAR PROGRAMMING PROBLEMS OF THE 1ST KIND[1]

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The report, in the continuation of research initiated in [1], the problem of P matrix correction of improper linear programming (LP) of the 1st kind of the minimum weighted Euclidean norm in the case where the elements of the augmented matrix $[A \ -b]$ coefficients of its limitations divided into a plurality of adjustable $[K^+ \ k^+]$ and uncorrectable $[K^- \ k^-]$ elements.

Theorem. *If the problem P has a solution, then the desired vectors and matrices can be constructed by direct formulas that depend on the solutions (soluble under these conditions) unconstrained minimization problem.*

$$\Phi(\tilde{x}) = \sum_{i=1}^{m} \frac{(b - A\,(\mathrm{diag}(\tilde{x})\tilde{x}))_i^2 \cdot \left| s\left(\begin{bmatrix} \mathrm{diag}(\tilde{x})\tilde{x} \\ 1 \end{bmatrix}, \begin{bmatrix} \mathcal{H}_{i*}^\top \\ \chi_i \end{bmatrix} \right) \cdot \mathrm{diag}\left(\begin{bmatrix} \mathcal{W}_{i*}^\top \\ \omega_i \end{bmatrix} \right) \right|^2}{\left(s^\top \left(\begin{bmatrix} \mathrm{diag}(\tilde{x})\tilde{x} \\ 1 \end{bmatrix}, \begin{bmatrix} \mathcal{H}_{i*}^\top \\ \chi_i \end{bmatrix} \right) \cdot s\left(\begin{bmatrix} \mathrm{diag}(\tilde{x})\tilde{x} \\ 1 \end{bmatrix}, \begin{bmatrix} \mathcal{H}_{i*}^\top \\ \chi_i \end{bmatrix} \right) \right)^2} \to \min,$$

where the coefficients $\begin{bmatrix} \mathcal{W}_{i*}^\top \\ \omega_i \end{bmatrix}$ *determine the weight of each i-th row correction matrix* $[H \ -h]$ *in the objective function,* $\mathcal{H}_{i*}$ *- i-th row of the matrix* $\mathcal{H}$, $s(p,q) = (s(p,q)_i) \left| \begin{array}{ll} s(p,q)_i = p_i, & \texttt{if } q_i \neq 0 \\ s(p,q)_i = 0, & \texttt{if } q_i = 0 \end{array} \right.$, $\mathcal{H} = (\mathcal{H}_{ij}) \left| \begin{array}{l} \mathcal{H}_{i,j} = 1, \texttt{ if } \{i,j\} \in \mathbf{K}^+ \\ \mathcal{H}_{i,j} = 0, \texttt{ if } \{i,j\} \in \mathbf{K}^- \end{array} \right.$, $\chi = (\chi_i) \left| \begin{array}{l} \chi_i = 1, \texttt{ if } \{i\} \in \mathbf{k}^+ \\ \chi_i = 0, \texttt{ if } \{i\} \in \mathbf{k}^- \end{array} \right.$.

Analytical formulas for the gradient of this function are given [2]. Computational procedure of minimization with the use of an algorithm Broyden-Fletcher-Goldfarb-Shanno is implemented. Results of model problems of middle dimension with sparse matrix coefficients from the catalog "lp/infeas"storage Netlib, illustrating the convergence of the argument and the objective function and the distribution of elements on the amendments are given.

REFERENCES

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2. Erohin V.I, Krasnikov A.S, Hvostov M.N. Quasi-Newton algorithms for matrix correction improper linear programming problems with an arbitrary set of adjustable coefficients // Bulletin of St PbSIT(TU). 2014. Number 23. pp. 87-92 (In Russian).

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