JOURNAL OF OPTIMIZATION THEORY AND APPLICATIONS: Vol. 16, Nos. 5/6, 1975

ERRATA CORRIGE

A Stable Approach to Newton's Method for General Mathematical Programming Problems in R^n

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Abstract. A modification to the algorithm of Ref. 1 is given.

Key Words. Newton–Raphson method, quasilinearization method, mathematical programming, nonlinear programming, quadratically convergent algorithms.

While programming the algorithm given in Section 3 of Ref. 1, we discovered that, although the local convergence result given there is correct, the algorithm may not converge if the initial iterate lies on the boundary of the region formed by the inequality constraints. The following simple modification to the algorithm will clear up this difficulty and in no way affects its local convergence properties.

In expression (24) of Ref. 1,

$$y_i^{k+1} = (1 - \delta_i(x^k, y^k)^+)\, y_i{}^k, \qquad i = p + 1,\ldots, m,$$

should be replaced with

$$y_i^{k+1} = \begin{cases} (1 - \delta_i(x^k, y^k)^+)\, y_i{}^k & \text{if } \delta_i(x^k, y^k)^+ y_i{}^k \neq 0, \\ \sqrt{(2 \mid g_i(x^{k+1})\mid)} & \text{if } \delta_i(x^k, y^k)^+ y_i{}^k = 0, \end{cases}$$

for $i = p + 1,\ldots, m$.

References

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