

Errata of the book  
“Practical Augmented Lagrangian Methods for Constrained Optimization”  
by E. G. Birgin and J. M. Martínez  
(Last update: August 31, 2015)

**Jun/22/2015:** In (6.24),  $\mu_{i+1}^k$  should be  $\mu_i^{k+1}$ .

**Jun/22/2015:** In page 59, line -2, “problem (6.1)” should be “problem (7.1)”.

**Jun/22/2015:** In page 60, line 9, “problem (6.1)” should be “problem (7.1)”.

**Aug/21/2015:** In (12.5), the (2, 2) block should be  $-\frac{1}{\rho}I$  instead of  $-\rho I$ .

**Aug/21/2015:** In page 114, in the equation displayed after (10.3), “or  $\lambda_j + \rho c_j(x) > 0$ ” might be replaced with “or  $j \in I$  such that  $\lambda_j + \rho c_j(x) > 0$ ” for clarity. The same remark applies to the equation between equations (10.5) and (10.6) on page 116.

**Acknowledgment.** We would like to thank the readers that contributed to the present list of typos. Up to the present moment, our thanks to Andres Sajo Castelli.

**Aug/21/2015: Omission.** At the beginning of Chapter 10 it should be written that Algencan is an *affordable* algorithm (in the sense of the ideas of Chapter 6) that implements the Augmented Lagrangian techniques described in the book. It should also be stressed that only bound constraints are considered as lower-level constraints, meaning that the Augmented Lagrangian subproblem (4.6) (or (6.4)) that is solved at iteration  $k$  of Algorithm 4.1 is a bound-constrained subproblem. Thus, as described on pages 48 to 50 of Chapter 6, conditions (6.2) and (6.3) of Assumption 6.1, that are the conditions that the approximate subproblem’s solution  $x^k$  of the  $k$ -th iteration satisfies, reduce to

$$\|P_{\Omega}(x^k - \nabla L_{\rho_k}(x^k, \bar{\lambda}^k, \bar{\mu}^k)) - x^k\| \leq \varepsilon'_k. \quad (1)$$

Using the notation of Chapter 10 for the Lagrangian and the Augmented Lagrangian functions (see (10.2) and (10.3)), the fact that in practice the original problem (10.1) may be scaled (see (10.4) and (10.5)), and considering the sup-norm and the Lagrange multipliers’ update rules (4.7) and (4.8), it can be seen (see pages 141 and 142) that (1) is equivalent to

$$\left\| P_{[\ell, u]} \left( x^k - \left[ w_f \nabla f(x^k) + \sum_{j=1}^m \lambda_j^{k+1} w_{c_j} \nabla c_j(x^k) \right] \right) - x^k \right\|_{\infty} \leq \varepsilon'_k,$$

whose left-hand side coincides with the left-hand side of (10.6).

Therefore, within Section 10.2.2, it may be described in which way the the tolerance  $\varepsilon'_k$  to declare convergence of the subproblem at iteration  $k$  is defined. Naming  $a_k$  and  $b_k$  the left-hand sides

of (10.6) and (10.7), respectively, it should be said that the sequence  $\{\varepsilon'_k\}$  (of Assumption 6.1) is heuristically defined as  $\varepsilon'_1 = \sqrt{\varepsilon_{\text{opt}}}$  and, for  $k \geq 1$ ,

$$\varepsilon'_{k+1} = \begin{cases} \min\{\frac{1}{2}a_k, \frac{1}{10}\varepsilon'_k\}, & \text{if } a_k \leq \sqrt{\varepsilon_{\text{opt}}} \text{ and } b_k \leq \sqrt{\varepsilon_{\text{feas}}}, \\ \varepsilon'_k, & \text{otherwise.} \end{cases}$$