Errata for *Set-valued, Convex, and Nonsmooth Analysis in Dynamics and Control* by Rafal K. Goebel

p. 17, l. 3, "$\tau = T_D$" should be "$\tau = J_D$"

p. 26, l. -9, in the definition of $\operatorname{rge} S$, "$x \in \mathbb{R}^n$" should be "$x \in \mathbb{R}^m$"

p. 27, l. 5, in item (b): "$x_i \to x$" should be "$x_i \to \overline{x}$"

p. 29, l. 11, in Example 2:14, "$U : \mathbb{R}^n \to \mathbb{R}^m$" should be "$U : \mathbb{R}^n \rightrightarrows \mathbb{R}^m$"

p. 30, l. 1, "(2.6)" should be "(2.5)"

p. 31, l. -7, in Exercise 2.20, "$x_0 + u_1 + u_2$" should be "$x_0 + u_0 + u_1$"

p. 31, l. -1, "$\liminf_{i\to\infty} f(x_i) \leq f(\overline{x})$" should be "$\liminf_{i\to\infty} f(x_i) \geq f(\overline{x})$"

p. 40, l. 8, "(3.2)" should be "(3.5)"

p. 50, l. 3, item (ii), "$A \in \mathbb{R}^{m\times n}$" should be "$A \in \mathbb{R}^{n\times m}$"

p. 50, l. 3, item (ii), "$C \in \mathbb{R}^m$ and $D \in \mathbb{R}^n$" should be "$C \subset \mathbb{R}^m$ and $D \subset \mathbb{R}^n$"

p. 50, l. 8, "$x = \lambda u$, $y = \lambda v$" should "$x = \alpha u$, $y = \alpha v$"

p. 52, l. 5, "$\operatorname{con} C$" should be "$\overline{\operatorname{con}} C$"

p. 54, l. 12, "$B = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$" should be "$B = (0, 1)$"

p. 58, the second part of the proof of Proposition 4.20 has inconsistent subscripts and lacks upper limits in sums. The second part of the proof should be:

> To show the opposite inclusion, fix $x \in O$ and take any $y \in F_K(x)$. Then, for every $\delta > 0$, there exist $y_\delta \in \operatorname{con} f\,((x + \delta\mathbb{B}) \cap O)$ arbitrarily close to y. Note that because O is open, for all small enough δ, $x + \delta\mathbb{B} \subset O$. Considering $\delta = i^{-1}$ and large enough i, there exist $y_i \in \operatorname{con} f\left(x + i^{-1}\mathbb{B}\right)$ convergent to y. Each such $y_i = \sum_{k=0}^{n} \lambda_{i,k} y_{i,k}$ for some $\lambda_{i,k} \in [0, 1]$, $\sum_{k=0}^{n} \lambda_{i,k} = 1$, and $y_{i,k} \in f\left(x + i^{-1}\mathbb{B}\right)$. Because f is locally bounded, subject to passing to a subsequence, the sequences $\lambda_{i,k}$ and $y_{i,k}$ converge as $i \to \infty$, to limits λ_k and y_k, and $\lambda_k \in [0, 1]$, $\sum_{k=0}^{n} \lambda_k = 1$, and $y_k \in \overline{f\,(x + \delta\mathbb{B})}$ for every $\delta > 0$, and so $y_k \in \bigcap_{\delta>0} \overline{f\,(x + \delta\mathbb{B})}$. Also, $y = \sum_{k=0}^{n} \lambda_k y_k$, so that $y \in \operatorname{con} \bigcap_{\delta>0} \overline{f\,(x + \delta\mathbb{B})}$. Because the sets $(x + \delta\mathbb{B}) \cap O$ are decreasing with δ, and for small enough δ they equal $x + \delta\mathbb{B}$, $y \in \operatorname{con} \bigcap_{\delta>0} \overline{f\,((x + \delta\mathbb{B}) \cap O)}$.

p. 64, l. -4, "$u' = (u_1, u'_2, \ldots, u'_n)$" should be "$u' = (u'_1, u'_2, \ldots, u'_n)$"

p. 72, l. 1, "$\phi_k(t) := x_i + (t - t_i)v_0$" should be "$\phi_k(t) := x_i + (t - t_i)v_i$"

p. 91, l. 18, "$w(x) = A$" should be "$w(x) = 0$"

p. 91, l. -16, in Exercise 6.13, "$\{x \in O \,|\, V(x) \leq r\}$" should be "$\{x \in O \,|\, w(x) \leq r\}$"

p. 94, l. 24, in Exercise 6.19, "conclusions in (c), (e)" should be "conclusions in (e)"

p. 102, l. -5, "Exercise 7.10 or 7.9" should be "Exercise 7.8 or 7.9"

p. 106, l. 13, "such that $z + (v, 0) \in \operatorname{epi} f$ for all $t \geq 0$" should be "such that $z + t(v, 0) \in \operatorname{epi} f$ for all $t \geq 0$"

p. 120, l. 8, "any convergent sequence $(x_i, y_i) \in M$" should be "any convergent sequence $(x_i, y_i) \in \operatorname{gph} M$"

p. 120, l. -13, the three-line displayed calculation is nonsense, and it should be:

$$\begin{aligned}(x - \overline{x}) \cdot (y - \overline{y}) &= (1 - \lambda)(x - \overline{x}) \cdot (y - y_1) + \lambda(x - \overline{x}) \cdot (y - y_2) \\ &\geq 0.\end{aligned}$$

p. 125, l. 2, in (8.20), it should be "$\dot{x} = F_k(x) := -\nabla f(x) - k(x - P_C(x))$". Two lines further, in l. 4, it should say "Since $-F_k$ is the gradient of a convex function".

p. 125, l. 15, in the 4th line of the displayed formula for $2\alpha_k(t)\dot{\alpha}_k(t)$, "$-2(\phi_k(t) - P_C(\phi_k(t))\nabla f(\phi_k(t)))$" should be "$-2(\phi_k(t) - P_C(\phi_k(t))) \cdot \nabla f(\phi_k(t))$"

p. 136, l. 8, "which leads to $g"(0; v) = v$ for $v > 0$. Similar arguments shows $g"(0; v) = -v$ for $v < 0$." should be "which leads to $g^\circ(0; v) = v$ for $v > 0$. Similar arguments shows $g^\circ(0; v) = -v$ for $v < 0$."

p. 139, l. 10, "at almost $t \in [0, T]$" should be "at almost all $t \in [0, T]$"

p. 152, l. 2, “is *robust* if there exists a continuous function $\rho : B(A) \to [0, \infty)$” should be “is *robust* if the basin of attraction $B(A)$ is a neighborhood of A and there exists a continuous function $\rho : B(A) \to [0, \infty)$”

p. 169, l. -7 and l. -5, “λ” should be “α”

p. 184, l. 4, “$((t_{j-1}, j], j)$” should be “$((t_{j-1}, t_j], j)$”

p. 186, l. -20, in Exercise 12.8, “Example 2.2” should be “Example 12.4”

p. 187, l. -12, “for all $I > i_\varepsilon$” should be “for all $i > i_\varepsilon$”

p. 188, proof of Theorem 12.8 uses should not use K as a subscript in j_{K^i} because K is a compact set in the theorem. Once one replaces all K in subscripts with M, in line -2, “$\phi_i(\cdot, j_K^i)$” should be “$\phi_i(\cdot, j_{M^i})$”

p. 190, l. 5, “and $H(x) = \emptyset$ otherwise” should be “and $H(x) = \{x\}$ otherwise”

p. 192, l. 16, “Any such solution is also a solution to (12.3)” should be “Any such solution is also a solution to (12.10)”

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