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. 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 $y_\delta \in \operatorname{con} f\left((x + \delta\mathbb{B}) \cap O\right)$ 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 $y_k \in \overline{f\left(x + \delta\mathbb{B}\right)}$ for every $\delta > 0$, and so $y_k \in \bigcap_{\delta>0} \overline{f\left(x + \delta\mathbb{B}\right)}$. Also, $y = \sum_{k=0}^{n} \lambda_k y_k$, so that $y \in \operatorname{con} \bigcap_{\delta>0} \overline{f\left(x + \delta\mathbb{B}\right)}$. Because the sets $(x + \delta\mathbb{B}) \cap O$ are decreasing with δ, and for small enough δ they equal $x + \delta\mathbb{B}$, $y \in \operatorname{con} \bigcap_{\delta>0} \overline{f\left((x + \delta\mathbb{B}) \cap O\right)}$.

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), there should be a $-$ in front of k, i.e., 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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