

Errata List For
Nonlinear Systems – Third Edition
Updated on September 2, 2026
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Preface

1. Page xiv, Line 5: Change “books” to “book”

Chapter 1

1. Page 10, Line 3: Change “Coulombs plus” to “Coulomb plus”
2. Page 24, Second line of Exercise 1.4: Change “++” to “+”
3. Page 27, Exercise 1.13(c): Change “Section 1.3” to “Section 1.2.3”
4. Page 27, Exercise 1.14: Change “ v the” to “ v is the”

Chapter 2

1. Page 52, Last line: change “3” to “4”
2. Page 61, Last line: insert “and $V(x) < c$ inside the curve” after “differentiable”
3. Page 67, Second line of footnote: Change “is a also” to “is also”
4. Page 81, Exercise 2.14: Change “ $\ddot{y}$ ” to “ $m\ddot{y}$ ”
5. Page 82, Exercise 2.18: Change “ $zg(z) > 0$ ” to “ $zg(z) > 0$ for $z \neq 0$ ”

Chapter 3

1. Page 105, Exercise 3.2(5): Change “Section 1.2.5” to “Section 1.2.6”
2. Page 108, Hint of Exercise 3.19: change “ $\|x - y\| \geq \min_i r_i$ ” to “ $\|x - y\| \geq c$ for some $c > 0$ ”
3. Page 109, Exercise 3.27: Change “ $f((t, x_i(t)))$ ” to “ $f(t, x_i(t))$ ”

Chapter 4

1. Page 113, Line 17: Change “for any ε ” to “for any sufficiently small ε ”
2. Page 123: Remove the six-line segment from “For $\Omega_c \dots$ ” to “ $\dots$ only for $c < 1$.”, which start at Line 9 from the bottom. The discussion is not valid.
3. Page 125, Figure 4.5: At the bottom right corner change “ $x_2 = x_1$ ” to “ $x_2 = -x_1$ ”
4. Page 128, Line 21: Change “ Ω_c is bounded” to “ Ω_c has a bounded component”
5. Page 145, Lemma 4.2: See Lemma 4.1 of H.K. Khalil, Nonlinear Control, 2015, for better definitions of domains.
6. Page 145, Lemma 4.3: Replace the last two sentences “If $D = R^n \dots \dots$ class $\mathcal{K}_\infty$.” by “If $D = R^n$ and $V(x)$ is radially unbounded, then there exist class $\mathcal{K}_\infty$ functions α_1 and α_2 such that the foregoing inequalities hold for all $x \in R^n$.”
7. Page 152, Line 7: Insert “for $\alpha_2(\|x(t_0)\|) \leq c < \alpha_1(r)$ ” after “we see that”
8. Page 152, Theorem 4.9: Change the sentence “Moreover, $\dots$ satisfies” on lines 5 to 7 of the theorem to “Moreover, if $W_1(x) \geq \alpha_1(\|x\|)$, $W_2(x) \leq \alpha_2(\|x\|)$, and r and c are chosen such that $B_r = \{\|x\| \leq r\} \subset D$ and $c < \alpha_1(r)$, then every trajectory starting in $\{x \in B_r \mid \alpha_2(\|x\|) \leq c\}$ satisfies”
9. Page 153, Lines 9 and 15: Change “defined on $[0, r]$ ” to “defined on $[0, \alpha_1(r)]$ ”

10. Page 156, Equation (4.29): Change $A(t)x$ to $A(t)x(t)$
11. Page 163, Line 4: Change “a function V ” to “a continuously differentiable function V ”
12. Page 167, Line 2: Change “Theorem 4.15” to “Theorem 4.14”
13. Page 170, Line after (4.37): Insert “for some $\mu > 0$.”
14. Page 175, Second line of Definition 4.7: Change “for any initial state” to “for any initial time t_0 , any initial state”
15. Page 176, Line 17: Change “consequences” to “consequence”
16. Page 176, Line 3 of the proof of Lemma 4.6: Change “satisfies (4.10) through (4.12)” to “satisfies the inequalities of the theorem”
17. Page 182, Exercise 4.6: change “for all $z \in R$ ” to “for all $z \neq 0$ ”
18. Page 184, Exercise 4.19: change “roots” to “root”
19. Page 185, Exercise 4.21, part (b): Take $D = R^n$
20. Page 186, Line 4: Change “nonsingular” to “positive definite”
21. Page 186, Line 4 from the bottom: Change “point asymptotically” to “point is asymptotically”
22. Page 188, Exercise 4.35, change “ $\forall r_1, r_2 \in [0, a)$ ” to “ $\forall r_1, r_2 \in [0, a/2)$ ”
23. Page 190, Exercise 4.49, change “exponentially” to “asymptotically” and “ Y_1^2 ” to “ y_1^2 ”

Chapter 5

1. Page 198, Line 6: Change “ u_τ ” to “ u ”
2. Page 201, Definition 5.2: Change “with $\sup_{0 \leq t \leq \tau} \|u(t)\| \leq r$ ” to “and $\tau \in [0, \infty)$ with $\sup_{t \geq 0} \|u(t)\| \leq r$ ”
3. Page 206, Line 16: Change “ $x_0 \in R$ ” to “ $x_0 \in R^2$ ”
4. Page 209, four lines before Section 5.3: Change “ $W_3(x) = -(1 - \theta)\|x\|_2^4$ ” to “ $W_3(x) = (1 - \theta)\|x\|_2^4$ ”
5. Page 211, Line 4: Change “ $f(x)$ is locally Lipschitz, and $G(x), h(x)$ are” to “ $f(x), G(x)$ are locally Lipschitz and $h(x)$ is”
6. Page 218, Line 2 from the bottom: Change “competed” to “completed”
7. Page 219, Example 5.13: Change “ $e_2 = \psi(t, y_2)$ ” to “ $y_2 = \psi(t, e_2)$ ”
8. Page 221, Line 10 from the bottom: Change “is $\mathcal{L}$ stable.” to “is $\mathcal{L}$ stable if $\varepsilon\gamma_1\gamma_f < 1$.”
9. Page 223, Problem 5.11(7): Change “ $\dot{x}_2 = x_1 - x_3 + u$ ” to “ $\dot{x}_2 = x_1 - x_2 + u$ ”
10. Page 224, Exercise 5.16, part (a): remove “finite-gain”

Chapter 6

1. Page 228, Line 10 of Section 6.1: Change “ $uy = Gy^2$ ” to “ $uy = Gu^2$ ”
2. Page 232, Line 10 from the bottom: Change “ Ly ” to “ Lu ”
3. Page 238, Line 8: Change “of of” to “of”

4. Page 238, Lemma 6.1: Change the third bullet to: either $G(\infty) + G^T(\infty)$ is positive definite or it is positive semidefinite and $\lim_{\omega \rightarrow \infty} \omega^{2(p-q)} \det[G(j\omega) + G^T(-j\omega)] > 0$, where $q = \text{rank}[G(\infty) + G^T(\infty)]$. The proof of the corrected lemma is given in the paper: Corless, M. and Shorten, R., “On the Characterization of Strict Positive Realness for General Matrix Transfer Functions”, *IEEE Transactions on Automatic Control*, Vol. 55, No. 8, pp. 1899–1904, 2010.
5. Page 239, Line 7 from the bottom: Change the (1,1) element of the matrix¹ from “ s ” to “ $s + 1$ ”
6. Page 239, Line 3 from the bottom: Change the (1,1) element of the matrix from “ ω^2 ” to “ $\omega^2 + 1$ ”
7. Page 239, Last line: Change the (1,1) element of the matrix from “ $s/(s + 1)$ ” to “ $(s + 2)/(s + 1)$ ”
8. Page 240, Line 4: Change the (1,1) element of the matrix from “ $2\omega^2/(1 + \omega^2)$ ” to “ $2(2 + \omega^2)/(1 + \omega^2)$ ”
9. Page 240, Line 5: Change “Taking $M^T = \begin{bmatrix} 0 & 1 \end{bmatrix}$, it can be verified that $\lim_{\omega \rightarrow \infty} \omega^2 M^T [G(j\omega) + G^T(-j\omega)] M = 4$ ” to “and $\lim_{\omega \rightarrow \infty} \omega^2 \det[G(j\omega) + G^T(-j\omega)] = 4$ ”
10. Page 241: First line of proof of Lemma 6.4: Change “ $V(s)$ ” to “ $V(x)$ ”
11. Page 244, Example 6.5: Change “ f is locally Lipschitz, G and h are continuous” to “ f and G are locally Lipschitz, h is continuous”
12. Page 244, Line 6 from the bottom: Change “ $-ky^T y$ ” to “ $ky^T y$ ”
13. Page 245, Section 6.5: In describing the feedback connection of Figure 6.11 it should be noted that u_1 , y_1 , u_2 , and y_2 could be vectors of the same dimension.
14. Page 257, Line 4 to 6 from the bottom: Change “the condition

$$\text{Re} \left[\frac{1 + j\omega a}{1 - \omega^2 + j\omega} \right] = \frac{1 + (a - 1)\omega^2}{(1 - \omega^2)^2 + \omega^2} > 0, \quad \forall \omega \in \mathbb{R}$$

if $a \geq 1$. Thus, choosing $a \geq 1$, we can apply Lemmas 6.3 and 6.4 to conclude that” to “the conditions

$$\text{Re} \left[\frac{1 + j\omega a}{1 - \omega^2 + j\omega} \right] = \frac{1 + (a - 1)\omega^2}{(1 - \omega^2)^2 + \omega^2} > 0, \quad \forall \omega \in \mathbb{R}$$

and

$$\lim_{\omega \rightarrow \infty} \omega^2 \text{Re} \left[\frac{1 + j\omega a}{1 - \omega^2 + j\omega} \right] = a - 1 > 0$$

if $a > 1$. Thus, choosing $a > 1$, we can apply Lemmas 6.1 and 6.4 to conclude that”

15. Page 260, Exercise 6.9, Line 4: Change V to $\dot{V}$

Chapter 7

1. Page 285, Line 5 from the bottom should read as “Equation (7.29) can be written as” while Line 3 from the bottom should start with “Since the describing function $\Psi(a)$ is real, this equation ...”
2. Page 299, Line 2: Change “with $G(s)$ ” to “with output e , zero input, and $G(s)$ ”

Chapter 8

1. Page 304, Line 6 of the second paragraph: Change “differentiable).” to “differentiable) and $\text{rank}[\partial\eta/\partial x] = n - k$ in the set $\{x \in \mathbb{R}^n \mid \eta(x) = 0\}$.”
2. Page 311, Last line: Change “ $-\|y\|_2^4$ ” to “ $-\frac{1}{2}\|y\|_2^4$ ”
3. Page 312, Line 2: Change to “ $\dot{V} \leq -\frac{1}{4}\|y\|_2^4$, for $\|y\|_2 < \frac{1}{4k}$ ”

¹This $G(s)$ and the one given at the end of the page need to be corrected because $G(0) + G^T(0)$ is singular.

4. Page 313, Line 2: Change “ x_{pr} in Suppose” to “ x_{pr} in Figure 8.1. Suppose”
5. Page 313, Line 8 from the bottom: Change “find t_c by Figure 8.1. integrating” to “find t_c by integrating”
6. Page 332, Line 5: Change “to invariant sets” to “to bounded invariant sets”

Chapter 9

1. Page 340, Line 1: Change “(9.2)” to “(9.1)”
2. Page 342, Line 11 from the bottom: Change “ $\dot{V}(x)$ ” to “ $\dot{V}(t, x)$ ”
3. Page 344, Line 9 from the bottom: Change “ $V(t, x)$ ” to “ $V(x)$ ”
4. Page 365, Line 9 from the bottom: Change “root” to “solution”

Chapter 10

1. Page 405, Line 3 from the bottom: Change “ $x_{av}(0)$ ” to “ $\bar{y}(0)$ ”
2. Page 406, Line 8: Change “ $y_{av}(0)$ ” to “ $\bar{y}(0)$ ” (twice)

Chapter 11

1. Page 434, Equation (11.21) and Page 439, Equation (11.24): Change “ $\hat{y}(t/\varepsilon)$ ” to “ $\hat{y}((t - t_0)/\varepsilon)$ ”

Chapter 12

1. Page 474, Line 12 from the bottom: Change “contain” to “contains”
2. Page 482, Line 5: Change “ $\mathcal{K} = [\begin{matrix} K_1 & K_2 \end{matrix}]$ ” to “ $\mathcal{K} = [\begin{matrix} K_1 + K_3 C & K_2 \end{matrix}]$ ”
3. Page 482, Line 15: Change “We note $\dots K_3 = 0$ ” to “We note that in the stabilization of (x_{ss}, u_{ss}) we can take $K_3 = 0$ ”
4. Page 483, Line before Equation (12.24): Change “ ρ_3 ” to “ ρ_2 ”
5. Page 484, First line after the figure: Change “feedback” to “feedback”
6. Page 490, Line 10: Change “ $v = \alpha$ ” to “ $\rho = \alpha$ ”
7. Page 492, Line 22: Change “from ψ to u ” to “from ψ to $u - M_3(\alpha)e$ ”
8. Page 495, second line after (12.57): Change “initited” to “initiated”

Chapter 13

1. Page 517, Line 5 from the bottom: Change “reduces” to “reduces to”
2. Page 526, Line 8 of Example 13.13: Change “domain” to “region”
3. Page 527, Line 8 from the bottom: Change “ $\text{span}(g, ad_f g, ad_f^2 g)$ ” to “ $\text{span}(g, ad_f g, ad_f^2 g)$ ”
4. Page 533, five lines before Example 13.17: Change “ $\dot{\xi} = f_0(\eta, \xi)$ ” to “ $\dot{\eta} = f_0(\eta, \xi)$ ”
5. Page 535, Line 13: Change “Chapter 10” to “Chapter 9”

Chapter 14

1. Page 553, Line 5: It should be noted that $u = -\beta(x)\text{sgn}(s)$ is used only for $s \neq 0$ since in ideal sliding mode control u is not defined on the sliding surface $s = 0$. Alternatively, we can write $u = -\beta(x)\text{sgn}(s)$ for all s if $\text{sgn}(s)$ is not defined at $s = 0$. The same remark applies throughout the chapter to ideal sliding mode control.

2. Page 553, Line 10: Change “ $W = \sqrt{V}$ ” to “ $W = \sqrt{2V}$ ”
3. Page 553, Line 15: Change “ $\dot{V} \leq -2g_0\beta_0|s|$ ” to “ $\dot{V} \leq -g_0\beta_0|s|$ ”
4. Page 562: Line 2 from the bottom: Change “ $A_0P_0^T$ ” to “ $A_0^TP_0$ ”
5. Page 567, Line 6 from the bottom: Change “ $\Omega \subset T(D)$ ” to “ Ω is compact and subset of $T(D)$ ”
6. Page 568, Line 3 of Therm 14.1: Change “(4.11)” to “(4.13)”
7. Page 568, Line 3 of Theorem 14.2: Change “stale” to “stable”
8. Page 573, last line and Page 574, Lines 4, 7, and 9 from the bottom: Change “ r^ρ ” to “ $r^{(\rho)}$ ”
9. Page 575, Line 7: Change “exits” to “exists”
10. Page 574, Line 9 from the bottom: Change “ $r^\rho(t)$ ” to “ $r^{(\rho)}(t)$ ”
11. Page 577, Line 10: Change “ $L_f^\rho(x)$ ” to “ $L_f^\rho h(x)$ ”
12. Page 578, Line 15: Change “ $\bar{f}_0(z, e, w, r)$ ” to “ $\bar{f}_0(z, 0, w, r)$ ”
13. Page 578: To show the inequality satisfied by $\dot{V}_0$, we need the additional condition:

$$\left| \frac{\Delta(x_{ss}, v_1, w, r) - \Delta(x_{ss}, v_2, w, r)}{L_g L_f^{\rho-1} h(x_{ss}, w)} \right| \leq \ell |v_1 - v_2|, \quad 0 \leq \ell < 1$$

for all $(v_1, v_2, w, r) \in R \times R \times D_w \times D_r$.

14. Page 587, Line 9: Change “ $k_0 =$ ” to “ $k_0 \geq$ ” and “ $k =$ ” to “ $k \geq$ ”
15. Page 596, Lines 3 and 4: Change “ ϕ ” to “ ϕ_0 ”
16. Page 596, Last equation before Example 14.10: Change “ ϕ_2 ” to “ ϕ_1 ”
17. Page 610, Last equation: Change “ $k\zeta$ ” to “ $k\xi$ ”
18. Page 611, Line 14: Change “designing C ” to “designing H ”
19. Page 613, Line 6: Change “ $|G_o(j\omega)|$ ” to “ $\|G_o(j\omega)\|$ ”
20. Page 622, Theorem 14.6: In the fourth bullet of the theorem add the requirement that $f(\mathcal{X})$ is continuously differentiable in some neighborhood of $\mathcal{X} = 0$.
21. Page 625, Line 18: Change “ e_ρ ” to “ $\hat{e}_\rho$ ”
22. Page 644, Exercise 14.56(d): Change the units of I from “Kg/m²” to “Kg m²”

Appendix

1. Page 661, Lines 9 and 10: Change “ t_{12} ” and “ t_{13} ” to “ t_{21} ” and “ t_{31} ”, respectively
2. Page 662, Line 14: Change “If $D = R^n$,” to “If $D = R^n$ and $V(x)$ is radially unbounded,”
3. Page 662, Line 18: Change “If $V(x)$ ” to “Because $V(x)$ ”
4. Page 665: Change the second and third lines to

$$\|x(t)\| \leq \min\{\alpha(\|x(t_0)\|), U_r(t - t_0)\}, \quad \forall t \geq t_0, \quad \forall \|x(t_0)\| < r$$

Thus, inequality (4.20) is satisfied with $\beta(r, s) = \min\{\alpha(r), U_r(s)\}$.²

²This change was suggested by Professor E. Sontag because $U_r(s)$ is infinite at $s = 0$.

5. Page 670, Line 2 before Equation (C.16): Change “ $\omega(x^{(i)}(t_i))$ ” to “ $\omega(x^{(i)}(t_i))$ ”
6. Page 680, Line 2 from the bottom: Insert “where K_0 is the residue matrix of the pole $s = j\omega_0$.” before “Therefore”
7. Page 693: Replace lines 18 to 24 (starting with “This expression . . .” and ending with “. . . parameterized in η .”) by the following:³
This expression is valid for any $t \in R$. The limit of the integral term as $t \rightarrow -\infty$ is

$$\int_{-\infty}^0 \exp(-Bs) G(\pi(s; y(\tau), \eta), \eta(\pi(s; y(\tau), \eta))) ds \quad (C.60)$$

which is well defined because η is bounded, G is globally bounded in π , and B is Hurwitz. Let us rewrite the expression (C.60) with $y(\tau)$ replaced by y and denote it by $(P\eta)(y)$.

$$(P\eta)(y) = \int_{-\infty}^0 \exp(-Bs) G(\pi(s; y, \eta), \eta(\pi(s; y, \eta))) ds \quad (C.61)$$

With this definition, we can write

$$\begin{aligned} \exp[B(t - \tau)] [z(\tau) - (P\eta)(y(\tau))] = \\ z(t) - \int_{-\infty}^{t-\tau} \exp[-B(s - t + \tau)] G(\pi(s; y(\tau), \eta), \eta(\pi(s; y(\tau), \eta))) ds \end{aligned}$$

Substituting $\xi = s - t + \tau$ in the integral and using $\pi(\xi + t - \tau; y(\tau), \eta) = \pi(\xi; y(t), \eta)$, we obtain

$$\exp[B(t - \tau)] [z(\tau) - (P\eta)(y(\tau))] = z(t) - (P\eta)(y(t))$$

which shows that if $z(\tau) = (P\eta)(y(\tau))$, then $z(t) = (P\eta)(y(t))$ for all $t \in R$. Hence, $z = (P\eta)(y)$ defines an invariant manifold for (C.58)–(C.59) parameterized in η .

8. Page 695, Line 2: Change “ $\eta((\pi(t; y, \eta)))$ ” to “ $\eta(\pi(t; y, \eta))$ ”
9. Page 698, Equation (C.66): Change “ $A_1 +$ ” to “ $A_1 y +$ ”
10. Page 716, Lines 17 and 18: Change “ $U(x)$ ” to “ $U(\mathcal{X})$ ”

Bibliography

1. Page 725, Ref.[9]: Change “Anstaklis” to “Antsaklis”
2. Page 731, Ref.[93]: Change “1995” to “1994”
3. Page 732, Ref.[109]: Change “Trans. Amer. Math. Soc., 24:19–17” to “Amer. Math. Soc. Transl., Ser. 2, 24:19–77”
4. Page 737, Ref.[185]: Change “tracking” to “torque”

Index

1. Page 744, Feedback Passivation: Change “607” to “606”

In the third print of the book, a new typo appeared on page 553, line 13: Change “ $\dot{V}$ ” to “ $\dot{V}$ ”

³The need for this change in the proof was pointed out by Professor H. Shim. The original proof implicitly used $\lim_{t \rightarrow -\infty} \exp[-B(t - \tau)] z(t) = 0$, which cannot be guaranteed at this point in the proof because we cannot guarantee that $z(t)$ is bounded as $t \rightarrow -\infty$.