Introduction to Nonlinear Control

Errata for the First Edition

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This document contains a list of errata for the first edition of Introduction to Nonlinear Control: Stability, Control Design, and Estimation published by Princeton University Press. Please email Philipp Braun (philipp.braun@anu.edu.au) if you discover additional errors, and the errors will be included in future updates.

- (page 77), before Equation (3.44): "feasiblity" needs to be "feasibility".
- (page 77), below Equation (3.45): "$V(x) = z(x)Pz(x)$" needs to be "$V(x) = z(x)^\top Pz(x)$".
- (page 107), Equation (4.28): Equation (4.28) needs to be changed from

$$P = -\frac{1}{2\pi j}\oint_\Gamma \frac{G'_{ol}(s)G_{ol}(s)k}{1+G_{ol}(s)G_{ol}(s)k}\,ds \qquad \text{to} \qquad P = -\frac{1}{2\pi j}\oint_\Gamma \frac{G'_{ol}(s)k}{1+G_{ol}(s)k}\,ds$$

- (page 133), Definition 6.4: The role of y_0 can be made more precise by clarifying that it is a condition on the initial condition $y_0 = Cx_0 \in \Omega$ of the system (6.8).
- (page 140) Equation (6.30): In Equation (6.30) a bracket is missing. It should be $\frac{r_1}{r_2}\mathrm{Re}(\cos(\theta_1-\theta_2)+j\sin(\theta_1-\theta_2))$ instead of $\frac{r_1}{r_2}\mathrm{Re}(\cos(\theta_1-\theta_2)+j\sin(\theta_1-\theta_2)$.
- (page 146) Estimate of $\dot{V}(x)$: In the derivation of an estimate for $\dot{V}(x)$ on page 146, the term $-\varepsilon x^T(A^TP+PA)x$ needs to be replaced by $x^T(A^TP+PA)x$. In particular, the derivations should read

$$\begin{aligned}
\dot{V}(x) &= x^T(A^TP+PA)x - 2x^TPb\psi(y) + 2\eta\beta\psi(y)c\dot{x}\\
&= x^T(A^TP+PA)x - 2x^TPb\psi(y) + 2\eta\beta\psi(y)c(Ax-b\psi(y))\\
&\le x^T(A^TP+PA)x - 2x^TPb\psi(y)\\
&\quad + 2\eta\beta\psi(y)c(Ax-b\psi(y)) - 2\psi(y)(\psi(y)-\beta y)\\
&= x^T(A^TP+PA)x - 2x^T\left(Pb-\eta\beta A^Tc^T-\beta c^T\right)\psi(y)\\
&\quad - 2\left(\eta\beta cb+1\right)\psi(y)^2\\
&= x^T(A^TP+PA)x - 2x^T\left(Pb-\hat{c}^T\right)\psi(y) - 2d\psi(y)^2.
\end{aligned}$$

- (page 184): The expressions $\mathrm{sign}(\mathrm{dz}(u)) = \mathrm{sign}(\mathrm{sat}(u))$ and $\mathrm{sign}(q) = \mathrm{sign}(u-q)$ need to be replaced by $\mathrm{sign}(\mathrm{dz}(u))\,\mathrm{sign}(\mathrm{sat}(u)) \ge 0$ and $\mathrm{sign}(q)\,\mathrm{sign}(u-q) \ge 0$, respectively. The original expression are not necessarily correct in the case that $\mathrm{sign}(\cdot)$ is equal to zero.
- (page 187): In Equation (8.38) and in Equation (8.40), the term "$-Lq$" needs to be replaced by "$+Lq$" (four times).
- (Page 190) below Equation (8.51): "$x \in \mathbb{R}^{n_u}$" needs to be replaced by "$x \in \mathbb{R}^n$".
- (page 191): In the expression before Equation (8.53) the term "$-Lq$" needs to be replaced by "$+Lq$".
- (page 194) Equation (8.64): The term "$(Gw+Kx+Lq-q)$" needs to be replaced by "$(Gw+Kx+Lq-q+Hx)$", i.e., the term $+Hx$ is missing.
- (pages 197-198): In the matrix between Equation (8.70) and Equation (8.71), "D" needs to be replaced by "DW^{-1}". In Equations (8.71), (8.72) and in the Matrix after Equation (8.72), "D" needs to be replaced with "$D\Lambda_2$".

- (page 205): The equality

$$\dot{V}(x) = L_f V(x) + L_g V(x) k(x) + \tfrac{1}{2} \left(L_g V(x)\right)^2 + \tfrac{1}{2} w^2,$$

  needs to be replaced with the inequality

$$\dot{V}(x) \leq L_f V(x) + L_g V(x) k(x) + \tfrac{1}{2} \left(L_g V(x)\right)^2 + \tfrac{1}{2} w^2.$$

- (page 309) Theorem 13.2: The matrix C needs to satisfy $C \in \mathbb{R}^{p \times n}$ instead of $C \in \mathbb{R}^{p \times m}$.

- (page 335) Theorem 14.10: The matrix defined in (14.37) needs to be Schur (not Hurwitz).

- (page 471): In the first estimate of $\dot{V}(e_x)$ the expression "$(\bar{P}^T e_x)$" needs to be replaced by "$(\bar{P}^T e_x)^T$".