

Corrections -- January 30, 2000
Adaptive Control: Stability, Convergence, and Robustness

- p. 12, line 11: in eqn (0.3.5), replace " (θr) " by " (r) "
- p. 13, line 17: replace "Note that (0.3.15)" by "Note that (0.3.14)"
- p. 22, line 14: in eqn (1.4.9), replace the lower limit of the integral, "0", by " t_0 "
- p. 22, line 16: replace "(1.3.7)" by "(1.4.7)"
- p. 24, line 17: replace "for all $t \geq 0$ " by "for all $t \geq t_0 \geq 0$ "
- p. 37, line 5: in eqn (1.5.53), replace " $\phi(t + \delta, t)$ " by " $\Phi(t + \delta, t)$ "
- p. 37, line 18: in eqn (1.5.56), replace " ≤ 0 " by " ≥ 0 "
- p. 39, line 1: in eqn (1.5.61), replace " $d\tau$ " by " $d\sigma$ "
- p. 45, line 16: in eqn (2.0.3), replace " $y(t)$ " by " $y_p(t)$ "
- p. 48, line 18: in eqn (2.0.18), replace " $e_1^2(\tau)$ " by " $(\theta^T(t) w(\tau) - y_p(\tau))^2$ "
- p. 48, line 21: in eqn (2.0.19), replace " $e_1^2(\tau)$ " by " $(\theta^T(t) w(\tau) - y_p(\tau))^2$ "
- p. 50, line 5: in eqn (2.0.28), replace " $P(0) = P_0$ " by " $P(0) = P(0)^T = P_0$ "
- p. 50, line 7: in eqn (2.0.29), replace " $w(t) w^T(\tau)$ " by " $w(\tau) w^T(\tau)$ "
- p. 50, line 7: in eqn (2.0.29), replace " P_0 " by " P_0^{-1} " at *both* places
- p. 50, line 9: in eqn (2.0.30), replace " P_0 " by " P_0^{-1} " at *both* places
- p. 50, line 9: in eqn (2.0.30), replace " dt " by " $d\tau$ "
- p. 51, line 18: in eqn (2.0.38), replace " $a_m + k_m b_0(t)$ " by " $a_m - k_m b_0(t)$ "
- p. 51, line 19: in eqn (2.0.38), replace " $(b_0(t) - b_0^*)$ " by " $k_m (b_0(t) - b_0^*)$ "
- p. 52, line 3: in eqn (2.0.41), replace " $a_m e_1$ " by " $a_m e_1^2$ "
- p. 64, line 15: replace " $-\frac{1}{2}g$ " by " $-\frac{1}{2g}$ "
- p. 66, line 19: delete "that is the projection can only improve the convergence of the algorithm"
- p. 67, line 21: in eqn (2.4.9), replace " $\frac{d(P^{-1})}{dt}$ " by " $\| \frac{d(P^{-1})}{dt} \|$ "
- p. 68, line 27: in eqn (2.4.13), replace " $\beta(t)$ " by " $|\beta(t)|$ " at *both* places
- p. 69, line 1: replace " β " by " $|\beta|$ "
- p. 74, line 4: replace " $[A, C]$ " by " $[C, A]$ "
- p. 74, line 7: replace " $[A + KC, C]$ " by " $[C, A + KC]$ "
- p. 74, line 16: replace " $[0, w^T(t)]$ " by " $[w^T(t), 0]$ "
- p. 74, line 17-18: replace " $[-g w(t) w^T(t), w^T(t)]$ " by " $[w^T(t), -g w(t) w^T(t)]$ "
- p. 83, line 2: replace " $\text{Re}(\hat{M}(j\omega))$ " by " $\text{Re}(\hat{M}(j\omega))$ "
- p. 83, line 3: replace " $\text{Re}(\hat{M}(j\omega))$ " by " $\text{Re}(\hat{M}(j\omega))$ "
- p. 84, line 2: replace " c^T " by " $c^T(t)$ "

p. 88, line 13: replace $[A, c^T]$ by $[c^T, A]$

p. 88, line 18: replace "Using the triangle inequality" by "Using the fact that $(a - b)^2 \geq \frac{1}{2} a^2 - b^2$ "

p. 88, last 3 lines: insert factors of 1/2 as follows

$$\begin{aligned} \int_{t_0}^{t_0+\delta} e_1^2(\tau) d\tau &\geq \frac{1}{2} \int_{t_0}^{t_0+m\sigma} x_1^2(\tau) d\tau - \int_{t_0}^{t_0+m\sigma} x_2^2(\tau) d\tau \\ &\quad + \frac{1}{2} \int_{t_0+m\sigma}^{t_0+\delta} x_2^2(\tau) d\tau - \int_{t_0+m\sigma}^{t_0+\delta} x_1^2(\tau) d\tau \\ &\geq \frac{1}{2} \gamma_3(m\sigma) |e_m(t_0)|^2 - m\alpha_2 |\phi(t_0)|^2 \end{aligned}$$

p. 89, line 1: in eqn (2.6.38), replace " $n\alpha_1$ " by " $\frac{1}{2}n\alpha_1$ "

p. 89, line 3: adjust eqn (2.6.39) to read " $\frac{1}{2} \gamma_3(m\sigma) - \gamma_1 e^{-\gamma_2 m\sigma} \geq \gamma_3(m\sigma)/4$ "

p. 89, line 5: in eqn (2.6.40), replace " $n\alpha_1$ " by " $\frac{1}{2}n\alpha_1$ "

p. 89, line 7: in eqn (2.6.41), replace " $\gamma_3(m\sigma)/2$ " by " $\gamma_3(m\sigma)/4$ "

p. 101, line 4: replace " $\frac{k_p}{s+a_m} \hat{M}(\phi_r r + \phi_y y_p)$ " by " $\frac{k_p}{s+a_m} (\phi_r r + \phi_y y_p)$ "

p. 114, line 10: in eqn (3.3.17), replace " $+\varepsilon(t)$ " by " $-\varepsilon(t)$ "

p. 138, line 5: in eqn (3.5.27), replace " e_1 " by " e_0 "

p. 143, line 31: in the equation giving $|\phi^T(t)v(t)|$, replace " $\beta(t)$ " by " $|\beta(t)|$ " at *both* places

p. 148, line 9: replace "theorem 2.4.6" by "proposition 2.4.6"

p. 148, line 14: replace "the same conditions as β " by "the same conditions as $|\beta(t)|$ "

p. 155, line 8: replace "lemma 2.6.6" by "lemma 2.6.7"

p. 155, line 10: replace "lemma 2.6.5" by "lemma 2.6.6"

p. 161, line 12: in the title, replace "Sale" by "Scale"

p. 163, line 22: in eqn (4.1.30), replace " $\hat{P}(z)$ " by " $\hat{P}(r)$ "

p. 247, line 1: in eqn (5.5.49), replace " $-\varepsilon r(t)$ " by " $-g r(t)$ "

p. 247, line 13: in the caption for Fig. 5.15, replace " $r_1(t)$ " by " $r_1(t) = \sin(5t)$ "

p. 271, line 21: replace " $\phi(t) \rightarrow 0$ as $t \rightarrow 0$ " by " $\phi(t) \rightarrow 0$ as $t \rightarrow \infty$ "

p. 282, line 5: in proposition 6.3.1, delete "Let \hat{D}_R be column reduced and \hat{D}_L be row reduced"

p. 282, line 16: in the proof of proposition 6.3.1, delete "and \hat{D}_R column reduced"

p. 283, line 11: replace " $\hat{\xi} \in R^{p \times p}(s)$ " by " $\hat{\xi} \in R^{p \times p}[s]$ "

p. 284, line 10: replace "Morse [1979]" by "Morse [1976]"

p. 288, line 27: replace " \hat{D}_L row reduced" by " \hat{D}_L column reduced (such a matrix fraction description always exists (cf. Beghelli S. & R. Guidorzi, "A New Input-Output Canonical Form for Multivariable Systems," *IEEE Trans. on Autom. Control*, vol. 21, pp. 692-696, 1976))"

- p. 290, line 5: in eqn (6.3.22), replace " \bar{w} " by " \bar{w}^T "
- p. 338, line 1: in eqn (A3.6.5), replace " $t^r - k$ " by " t^{r-k} "
- p. 338, line 15: under "Derivation of (A3.6.10)", insert "When $r = 0$, $u(t) = z(t)$, so that (A3.6.10) is trivially true. When $r > 0$," (we have that ...)
- p. 339, line 1: in eqn (A3.6.12), replace " $\int_{-\infty}^t$ " (the first integral) by " \int_0^t "
- p. 339, line 12: in eqn (A3.6.15), replace ":@" by "\leq"
- p. 341, line 14: replace " $\beta(t)$ " by " $|\beta(t)|$ " at *both* places
- p. 356, line 10: in eqn (A6.2.13), replace " $m (\exp -\alpha - (t - \tau))$ " by " $m e^{-\alpha(t-\tau)}$ "
- p. 360, line 37-38: the title of the paper should be "Exponential Convergence and Robustness Margins in Adaptive Control" instead of "Small Signal..."
- p. 366, line 22: insert Luders, G., & K.S. Narendra, "An Adaptive Observer and Identifier for a Linear System," *IEEE Trans. on Automatic Control*, Vol. AC-18, no. 5, pp. 496-499, 1973.