Errata
Robust Process Control
Manfred Morari & Evanghelos Zafiriou
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p. i		"Department of Chemical and Nuclear Engineering" should be "Chemical Engineering"
p. 55	Line–3	"Frank (1984)" should be "Frank (1974)"
p. 58	Thm. 4.1-2 and all of p. 59	

Theorem 4.1-2. *The H_2-optimal complementary sensitivity function*

$$\tilde{\eta} = \tilde{p}\tilde{q} = \tilde{p}_A v_M^{-1}\{\tilde{p}_A^{-1} v_M\}_* \tag{4.1-8}$$

has the following properties:

1. *The poles of $\tilde{\eta}$ are among the mirror images of the plant RHP zeros and among the zeros of v_M.*

2. *$\tilde{\eta}$ has RHP zeros at the plant RHP zeros. $\tilde{\eta}$ can have additional RHP zeros.*

Proof.

1. The potential poles of $\tilde{\eta}$ are the poles of $\tilde{p}_A$, the zeros of v_M and the poles of $\{\tilde{p}_A^{-1} v_M\}_*$, which are the poles of v_M. However, the poles of v_M are cancelled by zeros of v_M^{-1} premultiplying $\{\cdot\}_*$.

2. $\tilde{\eta}$ has RHP zeros at $\tilde{p}_A$. Additional RHP zeros can arise from $\{\tilde{p}_A^{-1} v_M\}_*$. □

RHP zeros are generally considered as "bad" for performance. However, 2. implies that depending on the input v_M the optimal controller $\tilde{q}$ can sometimes *add* RHP zeros.

Example 4.4-1.

$$\tilde{p} = \tilde{p}_A = \frac{-s+2}{s+2}, v_M = \frac{s+1}{s} \tag{4.1-9}$$

$$\tilde{q} = \frac{s}{s+1}\left\{\frac{s+2}{-s+2}\frac{s+1}{s}\right\}_* = \frac{s}{s+1}\left\{-1+\frac{1}{s}+\frac{6}{-s+2}\right\}_* = \frac{-s+1}{s+1} \tag{4.1-10}$$

$$\tilde{\eta} = \frac{(-s+2)(-s+1)}{(s+2)(s+1)} \tag{4.1-11}$$

The controller $\tilde{q}$ added a RHP zero at (+1,0). □

p. 64 *Proof.*

Proof. Assume $p_A = \frac{-s+\zeta}{s+\zeta^H} \cdot \frac{-s+\zeta^H}{s+\zeta}$.

$$\begin{aligned}
\|e\|_2^2 &= \frac{1}{2\pi i}\int_{-i\infty}^{+i\infty} |(1-p_A)s^{-1}|^2 \, ds \\
&= \frac{1}{2\pi i}\int_{-i\infty}^{+i\infty} \left[2 - \frac{-s+\zeta}{s+\zeta^H}\cdot\frac{-s+\zeta^H}{s+\zeta} - \frac{s+\zeta^H}{-s+\zeta}\cdot\frac{s+\zeta}{-s+\zeta^H}\right] |s^{-1}|^2 ds \\
&= \mathrm{Res}_{s=\zeta}\left[-\frac{s+\zeta^H}{-s+\zeta}\cdot\frac{s+\zeta}{-s+\zeta^H}\cdot\frac{1}{s^2}\right] + \mathrm{Res}_{s=\zeta^H}\left[-\frac{s+\zeta^H}{-s+\zeta}\cdot\frac{s+\zeta}{-s+\zeta^H}\cdot\frac{1}{s^2}\right] \\
&= \frac{4\mathrm{Re}(\zeta)}{|\zeta|^2}
\end{aligned}$$

□

p. 68	Fig. 4.3-2	"1: $\lambda = 10$" should be "1: $\lambda = 0.1$" "3: $\lambda = 0.1$" should be "3: $\lambda = 10$"
p. 75	(4.5-1)	"$\lvert\tilde{p}\tilde{q}f\bar{\ell}_m\rvert$" should read "$\lvert\tilde{p}\tilde{q}\bar{\ell}_m\rvert$"
p. 86	Line–5	"unstable systems the sensitivity function" should be "unstable systems the complementary sensitivity function"
p. 91	Middle	"$\|(1-p\tilde{q}v\|_2^2$" should be "$\|(1-p\tilde{q}v)\|_2^2$"
p. 116-117		Table should be moved down on page (placement same as pages 62, 63)
p. 122	Fig. 6.1-4	"λ" should be "λ/Θ" "TIME" should be "TIME/Θ"
p. 143	2nd par.	"Out" should be "Our"
p. 206	(10.1-8)	$\pi(s) = \prod_{i=1}^{n_p}(s-\pi_i) = \det(sI - A)$
p. 220	Line–2	"Let the number of open-loop unstable poles of PC" should read "Let the total number of open-loop unstable poles of P and C"
p. 225	(10.3-13)	"$= \int_{-\infty}^{\infty}$" should be "$= \frac{1}{2\pi}\int_{-\infty}^{\infty}$"
p. 229	Line–14	"certainty" should be "certainly"
p. 239	2nd par. from bottom	replace all "$\|\ \|$" by "$\|\ \|_\nu$"

p. 240	Middle	"frequencies where $\ell_O(\omega) \geq 1$" should be "frequencies where $\bar{\ell}_O(\omega) \geq 1$"
p. 241	Eqn. above (11.1-15)	"$\sigma(\tilde{P})$" should be "$\bar{\sigma}(\tilde{P})$"
p. 244	Last line	"$W_2 = \tilde{P}\ell_I$" should be "$W_2 = \tilde{P}\bar{\ell}_I$"
p. 250	Line–5	"that the optimization problem is convex" should be "that after a nonlinear variable transformation the optimization problem is convex"
p. 272	Table 11.3-1	"-538.2" should be "-583.8"
p. 280	(11.4-12)	$G = \begin{pmatrix} 0 & 0 & -I \\ P & 0 & -P \\ P & I & -P \end{pmatrix}$ should be $G = \begin{pmatrix} 0 & 0 & -I \\ \tilde{P} & 0 & -\tilde{P} \\ \tilde{P} & I & -\tilde{P} \end{pmatrix}$
p. 280	Example 11.4-1	With the exception of (11.4-11) we assume $w = 1$.
p. 283	Last line of Proof	"$=$" should be "$<$"
p. 284	Table 11.4-1 Case 1	"$\bar{\sigma}B$" should be "$\bar{\sigma}(B)$"
p. 284	(11.4-23) (11.4-24) Eq. after (11.4-24)	"$\leq$" should be "$<$" second "$<$" should be "$\leq$" "$\leq$" should be "$<$"
p. 285	Proof on top half of page	for consistency with the rest of the other theorems replace "k" by "$1/k$"

p. 286	Top	"(ii) $H = hI : \mu^2 \begin{pmatrix} 0 & P^{-1} \\ P & P \end{pmatrix} = 1$" should read "(ii)$H = hI : \mu^2 \begin{pmatrix} 0 & \tilde{P}^{-1} \\ \tilde{P} & \tilde{P} \end{pmatrix} = 1$"
p. 286	Just before (11.4-32)	"Theorem 12.4-1" should be "Theorem 11.4-1"
p. 346	par. preceding (13.3-8)	"P" should be "$\tilde{P}$"
p. 357	Line–4	"Palozoglu" should be "Palazoglu"
p. 365	Middle (14.3-2)	"Corollary 14.3-4" should be "Corollary 14.3-5" "$sd(s)$" should be "$s^n d^n(s)$"
p. 366	top part of page	

Because $G(s)$ is stable the closed-loop system will be stable only if all the coefficients of

$$\det(sd(s)I + kN(s)) = s^n d^n(s) + \ldots + k^n \det N(0) = 0 \qquad (14.3-3)$$

are positive. If $G(s)$ is proper, the coefficient of the highest power of s in (14.3–3) will be the coefficient of the highest power of s in $d(s)$. This coefficient will be positive because of the stability assumption. The constant coefficient is $\det(kN(0))$ and therefore for closed-loop stability it is required that $\det(N(0)) > 0$ and $\det(G(0)) > 0$. □

p. 371	Corollary 14.4-2	"The stable system P is DIC if" should read "The stable system P is IC if"
p. 377	Table 14.4-1	p_{12} "$e^{-3.70s}$" should be "$e^{-3.79s}$" $p_{23}(0)$ "5.94" should be "5.984" $p_{31}(0)$ "0.204" should be "0.0204" $p_{32}(0)$ "0.33" should be "–0.33"
p. 377	Fig. 14.4-2	"E" should be "L_H"
p. 385	(14.5-22)	"$= I$" should be "$= 1$"
p. 397	Line 5	"Let the number of open-loop unstable poles of $P_\gamma^* C$" should read "Let the total number of open-loop

		unstable poles of P_γ^* and C"
p. 466	Table A.4-1, Column "C", 2nd row	"16.023" should be "–16.023"
p. 473	Line 5	"M. Latchman" should be "H. Latchman"
Back cover		"H_∞ optional" should be "H_∞ optimal"