

## Errata

Here are errors and their corrections in Ikonen, E. and K. Najim (2002) *Advanced Process Identification and Control*. Marcel Dekker Inc., New York, 310 p, as found by Jan 2005.

### Chapter 2

p. 14, the following footnote should be added to the end of paragraph with equations (2.2)–(2.4).

<sup>1</sup> If one of the inputs is taken to be a constant ( $\varphi_I \equiv 1$ ), the function will take the form  $f_2(\varphi) + \theta_I$ . In control and identification literature, this type of a polynomial of degree 1 is said to be a linear (or affine) function. In a strict mathematical sense, however, the principle of superposition is not satisfied and the function is not linear, unless  $\theta_I = 0$ . Notice, however, that the term  $f_2(\varphi)$  is linear.

p. 19, Eq. (2.23): " $\frac{\partial^2 J}{\partial \theta_{i,j}^2} = \dots$ " should be " $\frac{\partial^2 J}{\partial \theta_j \partial \theta_i} = \dots$ " (better notation).

p. 23, Table 2.1, first row of data: "19.1" should be "19.0" (error in 1<sup>st</sup> decimal)

p. 25, Eq. (2.55): " $C_F(6) - \overline{C_F} \dots C_F(7) - \overline{C_F} \dots C_F(90) - \overline{C_F}$ " should be " $C_F(6) - \overline{C_F} \dots C_F(7) - \overline{C_F} \dots C_F(90) - \overline{C_F}$ " (style error in subscripts)

p. 29, middle of page: "From (2.78), we have a recursive formula for which is substituted in (2.87)" should be "From (2.78), we have a recursive formula for  $\mathbf{R}(k-1)$  which is substituted in (2.87)" (missing text)

p. 30, Lemma 1: "The verification of the lemma can be obtained by multiplying the right-hand side by  $A + BCD$  from the right" should be "The verification of the lemma can be obtained by multiplying the right-hand side by  $\mathbf{A} + \mathbf{BCD}$  from the right" (missing bold notation)

p. 33–34. Section 2.3.3 on *a posteriori* prediction error is suspicious.

p. 45. After equation (2.183) the text should be "Now  $\mathbf{V} \neq \mathbf{0}$  and the covariance update becomes (see (2.156))". (the text should refer to (2.156), not to (2.167)).

### Chapter 4

p. 84, eq (4.12) the h and g should switch places, i.e., the equation should be

$$\begin{array}{ll} \hat{y} \equiv \hat{y} & H = K \\ g_1(\varphi, \cdot) \leftarrow y(1) & h_1(\varphi, \cdot) \leftarrow \varphi^T \mathbf{Z}_1 \\ \vdots & \vdots \\ g_h(\varphi, \cdot) \leftarrow y(h) & h_h(\varphi, \cdot) \leftarrow \varphi^T \mathbf{Z}_h \\ \vdots & \vdots \\ g_H(\varphi, \cdot) \leftarrow y(K) & h_H(\varphi, \cdot) \leftarrow \varphi^T \mathbf{Z}_K \end{array} \quad (4.12)$$

p.87, Example 25. Error in index numbering. "Equation" (4.29) should be

$$\alpha_h = 0 \text{ for } h = 0, 1 \text{ and } h = 3, 4, 5, \dots \quad (4.29)$$

p. 88, Example 26. Notation showing derivation is missing in (4.38). The equation should be

$$\alpha_2 = \frac{1}{2} \lim_{x \rightarrow 0} \frac{d}{dx} \left( \left( \frac{x}{c_1 x + c_2 x^2} \right)^2 \right) = -\frac{c_2}{c_1^3} \quad (4.38)$$

p. 94, there's an extra derivation in Eq (4.60), it should be

$$\tilde{\alpha}_i = \frac{\partial}{\partial \varphi_i} f = \sum_{h=1}^H \alpha_h \frac{\partial}{\partial \varphi_i} g_h(\varphi, \beta_h) \quad (4.60)$$

p. 96, bottom of page: "For  $\lambda = 1$ , the *smoother matrix* is given by the identity matrix,  $\mathbf{S} = \mathbf{I}$ ." should be "For  $\lambda = 1$ , the *smoother matrix* is given by the identity matrix,  $\mathbf{S} = \mathbf{I}$ ." (extra parenthesis)

p. 106, Theorem 1: "for all  $\varphi_i$ " should be "for all  $\varphi$ " (better form)

p. 107, Example 29: "defined by the centers of triangular add-1 fuzzy sets  $\beta_1 = [\beta_{1,1}, \dots, \beta_{1,5}]$ , and  $P_2 = 3$  (negative (N), zero (Z), positive (P) set by  $\beta_2 = [\beta_{2,1}, \beta_{2,2}, \beta_{2,3}]$ )." should be "defined by the centers of triangular add-1 fuzzy sets  $\tilde{\beta}_1 = [\tilde{\beta}_{1,1}, \dots, \tilde{\beta}_{1,5}]$ , and  $P_2 = 3$  (negative (N), zero (Z), positive (P) set by  $\tilde{\beta}_2 = [\tilde{\beta}_{2,1}, \tilde{\beta}_{2,2}, \tilde{\beta}_{2,3}]$ )." Also Eq (4.108):

$$\Delta u(k) = \sum_{p_1=1}^5 \sum_{p_2=1}^3 \tilde{\alpha}_{p_1, p_2} \tilde{\mu}_{1, p_1}(e(k), \beta_1) \tilde{\mu}_{2, p_2}(\Delta e(k), \beta_2)$$

should be

$$\Delta u(k) = \sum_{p_1=1}^5 \sum_{p_2=1}^3 \tilde{\alpha}_{p_1, p_2} \tilde{\mu}_{1, p_1}(e(k), \tilde{\beta}_1) \tilde{\mu}_{2, p_2}(\Delta e(k), \tilde{\beta}_2)$$

(tildes are missing from the betas)

### Chapter 5

p. 126, Eq. (5.56) The term  $b_{n_B-1}^*$  should be  $b_{n_B-1}$  (no star).

p. 129 Section 5.3.3 – just above Algorithm 25. The text "Assuming that the parameters  $n_A$  change slowly..." should be "Assuming that the parameters  $a_n$  and  $b_n$  change slowly..."

p. 130 Section 5.3.3 – just after Algorithm 25. In the text in the paragraph starting with "Owing to the recursion ..." all  $A_i^*$  should be replaced by  $A_i$  (poor notation).

### Chapter 7

p. 193, Eq. (7.61): " $\mathbf{K}_{\text{CAG}} = [\cdot]^\top$ " should be " $\mathbf{K}_{\text{CAG}} = [\cdot]$ " (no transpose)

### Appendix B

p. 286, Equation (B.6), the last summation should be negative (typing error), i.e.

$$\dots -c_1 [F_1(t) + F_2(t)] T_F(t)\}$$

p. 287, Equation (B.10), the '+' should be replaced by a '-' (typing error), i.e.

$$C_B = C_1 - \frac{X_C(1-V)Q_C}{F_1} \quad (1)$$

p. 288, Table B.1. 9'th row:  $V$  should be  $V_F$  (a missing subscript), 12'th row:  $T_{Bt}$  should be  $T_{Ft}$  (a wrong subscript).

p. 290, Table B.2, first row of data: "19.1" should be "19.0" (error in 1<sup>st</sup> decimal- same as on p.23)

p. 296, Eqs. (B.41)–(B.44): " $\frac{C_F(q^{-1})}{F_2(q^{-1})} = \dots, \frac{T_B(q^{-1})}{F_2(q^{-1})} = \dots, \frac{T_F(q^{-1})}{F_2(q^{-1})} = \dots, \frac{P(q^{-1})}{F_2(q^{-1})} = \dots$ " should be " $\frac{C_F(q^{-1})}{F_1(q^{-1})} = \dots, \frac{T_B(q^{-1})}{F_1(q^{-1})} = \dots, \frac{T_F(q^{-1})}{F_1(q^{-1})} = \dots, \frac{P(q^{-1})}{F_1(q^{-1})} = \dots$ " (wrong subscript in  $F$ )

### Bibliography

p. 310, ref. [33]: "E. Ikonen. Pedin polttoainekertymänmallintaminen ..." should be "E. Ikonen. Pedin polttoainekertymän mallintaminen ..." (missing space)