Corrections

Below are the errors found, but yet not corrected, in the "28:th january 2007 version".

- Page 11: There should be squares on the singular values in the two equations:

$$T^*Tu_k = \sigma_k^2 u_k, \quad k = 1, 2, 3, \cdots$$

  and

$$TT^*v_k = \sigma_k^2 v_k, \quad k = 1, 2, 3, \cdots.$$

- Page 56: In the displayed equation between (3.6.4) and (3.6.5) the $\mathcal{I}_w$ should be an $\mathcal{I}_{\hat{w}}$.

- Page 69: The time index in Lemma 4.1.4 is wrong. A correct version (I hope) is given below.

  Lemma 4.1.4. *Assume the observation process is normalized white noise (and for convenience denote y by w). Then the matrix function F defining the best linear causal estimator of $x(t)$ given the past history of w up to and including time $t-1$, i.e.*

$$\hat{x}(t) = \mathrm{E}[x(t)|\mathbf{H}_t^-(w)] = \sum_{s=-\infty}^{\infty} F(t-s)w(s)$$

  is given by

$$F(t) = \begin{cases} \Lambda_{xw}(t), & t > 0 \\ 0, & t \le 0 \end{cases}$$

  where Λ_{xw} is the cross covariance matrix of the processes x and w

  And in the proof:

$$\mathrm{E}\{(x(t)-\hat{x}(t))w(\tau)'\} = \mathrm{E}\{(x(t)-\sum_{s=-\infty}^{\infty} F(t-s)w(s))w(\tau)'\} = 0, \quad \tau \le t-1.$$

  which can be written as

$$\Lambda_{xw}(t-\tau) = \sum_{s=-\infty}^{\infty} F(t-s)I\delta(t-s) = F(t-\tau), \quad \tau \le t-1.$$

  And in order that $\hat{x}(t) \in \mathbf{H}_t^-(w)$, the function F has to be strictly causal.

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- Page 70: In Remark 4.2.3. Sylvesters inequality is not included in Section A.3 in the appendix. It can be found in [35, page 66] and says that if A is an $m \times n$-matrix and B is an $n \times q$-matrix, then

$$\text{rank}(A) + \text{rank}(B) - n \leq \text{rank}(AB) \leq \min\{\text{rank}(A), \text{rank}(B)\}$$

- Page 72: Second sentence from the end should be: (Denoted $\check{W}$ in (4.1.6))

- Page 75: The squares in the definition of the Hardy space norm should be removed, so we should write

$$||F|| := \lim_{\rho \downarrow 1} ||F_\rho||$$

and also in the sentence after the square should be removed, it should say $||f||_{\ell_p^2}$.

- Page 85: Last row: $u(s)$ should be replaced by $z(s)$.

- Page 88: First row: Reference to Theorem 4.4.2 (which does not exist) should be to Theorem 4.4.1.

- Page 141: In condition (iii) of Corollary 6.6.5, there should be a transpose on A, i.e. it should say

$$(CPA' + DB', A')\text{is observable ...}$$

- Page 149: The numbering of the Positive real lemma seems strange.

- Page 153: Last line. There is a missing (y), it should say

$$\hat{x}_k(t) = \text{E}^{\mathbf{H}_{[\tau, t-1]}(y)} x_k(t), \quad k = 1, 2, \ldots, n.$$

- Page 154: In the proof of Proposition 6.9.1, the equation after (6.9.9), there is a transpose missing on the D.

- Page 155: In the proof of Lemma 6.9.2. The components of $z(t)$ should be given by
$$z_k(t) := \text{E}^{\mathbf{H}_{[\tau-1, t+\tau-1]}(y)} x_k(t + \tau)$$
then since $\mathbf{H}_{[\tau, t+\tau-1]}(y) \subset \mathbf{H}_{[\tau-1, t+\tau-1]}(y)$,

$$\hat{x}_k(t + \tau) = \text{E}^{\mathbf{H}_{[\tau-1, t+\tau-1]}(y)} z_k(t)$$

- Page 171: Second line. It is true that $\bar{\mathbf{S}}_1 \subset \bar{\mathbf{S}}_1$, but not very informative. It should of course be $\bar{\mathbf{S}}_1 \subset \bar{\mathbf{S}}$.

- Page 192: An alternative proof for $(U\mathbf{S}) \cap \bar{\mathbf{S}} = \mathbf{X} \oplus \mathbf{W}$ goes like this:

$$(U\mathbf{S}) \cap \bar{\mathbf{S}} = (\mathbf{S} \oplus \mathbf{W}) \cap \bar{\mathbf{S}} = (\mathbf{S} \cap \bar{\mathbf{S}}) \oplus (\mathbf{W} \cap \bar{\mathbf{S}}),$$

  where we have used Proposition A.2.1 and the fact that $\mathbf{S}$ and $\mathbf{W}$ are orthogonal.

  Using that $\mathbf{W} \cap \bar{\mathbf{S}} = \mathbf{W}$, since $\mathbf{W} = U\mathbf{S} \ominus \mathbf{S} \subset \mathbf{S}^{\perp} \subset \bar{\mathbf{S}}$, and $\mathbf{S} \cap \bar{\mathbf{S}} = \mathbf{X}$, the statement follows.

- Page 204: In Proposition 8.4.3. for item (iv) it is assumed that there is realization as in (8.3.4) created such that the components of $x(0)$ forms a basis for $\mathbf{X}$, i.e. there is a positive definite matrix P satisfying the Lyapunov equation $P = APA' + BB'$.

- Page 209: In (8.4.33) the time index in the left hand side for the backward state should be $t - 1$, since it evolves backward in time.

- Page 212: "Suppose that (A, B) is observable" should be "Suppose that (C, A) is observable"