FUNDAMENTALS OF ADAPTIVE FILTERING

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Readers are welcome to bring to the attention of the author at sayed@ee.ucla.edu any typos or suggestions for improvements. The author is thankful for any feedback.

ERRATA

Chapter 2
- Prob. 2.4: replace $\mathsf{E}\,\tilde{\boldsymbol{x}}W\tilde{\boldsymbol{x}}^*$ by $\mathsf{E}\,\tilde{\boldsymbol{x}}^*W\tilde{\boldsymbol{x}}$.
- Prob. 2.17: replace $\{\boldsymbol{v},\boldsymbol{v}\}$ by $\{\boldsymbol{v},\boldsymbol{w}\}$.

Chapter 3
- Prob. 3.2, part (a): replace $c^*z = \alpha - c^*w^o$ by $c^*z = \alpha - c^*R_u^{-1}R_{du}$.
- Prob. 3.3, part (c): replace "is now given by" by "is now related to".
- Prob. 3.7, part (d): replace R_α by R_z and $\beta^* = b_{\mathrm{opt}}^*$ by $[1\ \ \beta^*] = b_{\mathrm{opt}}^*$.
- Prob. 3.12, Fig. 3.5: the label $\boldsymbol{y}(t)$ should appear at the output of the channel $c(t)$; remove $\boldsymbol{y}(i)$.

Chapter 4
- Prob. 4.9, part (a): replace "< 1" by "≤ 1".
- Prob. 4.21: replace the reference to Prob. 4.21 by a reference to Prob. 3.2.

Chapter 5
- Prob. 5.25, part (b): replace "w_i that solves" by "w_i with smallest perturbation to w_{i-1} that solves".
- Prob. 5.26, part (b): replace last $|h(i)|^4$ in $J(w)$ by $|h(i)|^2$. Also replace "$h(i_o) = 1$" by "$|h(i_o)| = 1$".

Chapter 7
- Prob. 7.3, weight vector update: replace $\boldsymbol{U}_i w_{i-1}$ by $\boldsymbol{U}_i w_{i-1-\alpha(K-1)}$.

Chapter 8
- Prob. 8.1, part (a): the expression for α should be scaled by $1/2$.

Chapter 9
- Prob. 9.3, part (b): replace "negative-definite" by "indefinite".
- Prob. 9.4: replace $1 - c$ by $1 - \mu c$.
- Prob. 9.15, part (b): replace $\|\overline{\boldsymbol{u}}_i\|_{\overline{\Sigma}}^2$ by $\|\check{\boldsymbol{u}}_i\|_{\check{U}\overline{\Sigma}\check{U}^*}^2$. In the expression of part (d), remove the factor 2.
- Prob. 9.30, part (b): expression for D should be $D = 2\mu\Lambda^\alpha - \mu^2(\Lambda^\alpha)^2$.
- Probs. 9.32 and 9.33: it is assumed in these problems that the nonstationary model is $\boldsymbol{w}_i^o = w^o + \boldsymbol{q}_i$ (i.e., it consists of random perturbations around a constant w^o) rather than as in item (2) of Prob. 9.31.
- Prob. 9.33: replace σ_v^2 by $\sigma_{\tilde{v}}^2$.

Chapter 10
- Prob. 10.5: the identity should read as follows: $u(i) * [e^{j\omega_o i}h(i)] = e^{j\omega_o i}\left([e^{-j\omega_o i}u(i)] * h(i)\right)$.
- Prob. 10.9: first row of C should be divided by $\sqrt{K}$ and not K.
- Prob. 10.11: replace $1/(M-1)$ by $1/M$.
- Last equation on page 607: rightmost term should be $e^{j\omega_k i}\left([e^{-j\omega_k i}u(i)] * h(i)\right)$.
- Page 609: replace $R(ze^{j2\pi k/K})$ and $R(e^{j(\omega+\omega_k)})$ by $R(ze^{-j2\pi k/K})$ and $R(e^{j(\omega-\omega_k)})$. Also, $r_k(i) = e^{j\omega_k i}r(i)$ and the last equation on the page should be $s_k'(i) * r_k(i) = s_k'(i) * e^{j\omega_k i}r(i)$.

Chapter 11
- Prob. 11.13, part (a): replace (11.5.1) by (11.5.7). Also, replace "$\widehat{w} =$" by "$w_s =$".
- Prob. 11.16, part (a): replace "$\widehat{w} =$" by "$w_s =$" and remove third line of [0 1] on the right.
- Eq. (11.9.11): replace $+b_2(i)$ by $-b_2(i)$.

- Prob. 11.28, part (b): ignore the correlations between $\{s_1, s_2\}$ and their shifted versions.

Chapter 12

- Prob. 12.3: replace $P_{-1} = \Pi$ by $P_{-1} = \Pi^{-1}$.
- Prob. 12.5, part (a): w should multiply $\mathrm{col}\{R_{N-1}, u_N\}$ on the right-hand side.
- Prob. 12.8, part (a): remove the * from the second U_N in recursion for P_N. In part (c), $w_{-1} = \bar{w}$.

Chapter 13

- Prob. 13.10, part (a): replace f^2 by a^2.

Chapter 14

- Alg. 14.6.1 and Prob. 14.5: replace ξ by ζ. Also, in Alg. 14.6.1, $\gamma_M^{-1}(i) = \zeta_M^f(i)\zeta_M^{-b}(i)/\lambda^M$.
- Prob. 14.10: it is assumed that $u_i\Psi = u_{i-1}$.
- Prob. 14.11, downdating step: replace $g_{i-1}^L\gamma_L^{-1/2}(i-1)$ by $-g_{i-1}^L\gamma_L^{-1/2}(i-1)$.
- Prob. 14.14, part (a): 2nd column of pre-array should read as follows:

$$\left[\begin{array}{c} \left[\begin{array}{ccccc} u^{(1)}(i) & u_{i-1}^{(1)} & \ldots & u^{(N)}(i) & u_{i-1}^{(N)} \end{array} \right] \bar{L}_{i-1} \\ \bar{L}_{i-1} \end{array} \right], \quad \text{where} \quad \bar{L}_{i-1} = \mathrm{diag}\left\{ \bar{L}_{i-1}^{(1)}, \ldots, \bar{L}_{i-1}^{(N)} \right\}$$

- Prob. 14.15: definitions should read as follows:

$$u_i^{(3)} = \left[\begin{array}{ccc} u(i)u(i-1) & \ldots & u(i-M+2)u(i-M+1) \end{array} \right]$$
$$u_i^{(4)} = \left[\begin{array}{ccc} u(i)u(i-2) & \ldots & u(i-M+3)u(i-M+1) \end{array} \right], \quad u_i^{(M+2)} = \left[\begin{array}{c} u(i)u(i-M+1) \end{array} \right]$$
$$w^{o(3)} = \left[\begin{array}{ccc} w^o(0,1) & \ldots & w^o(M-2,M-1) \end{array} \right]$$
$$w^{o(4)} = \left[\begin{array}{ccc} w^o(0,2) & \ldots & w^o(M-3,M-1) \end{array} \right], \quad w^{o(M+2)} = \left[\begin{array}{c} w^o(0,M-1) \end{array} \right]$$

Chapter 15

- Prob. 15.4: replace $\zeta_m^{b/2}(i-1)$ by $\zeta_m^b(i-1)$ in expression for ρ.
- Page 914, second equation: replace $\bar{f}_M(i)$ by $\bar{b}_M(i)$.
- Prob. 15.9: in the state estimator equations of parts (a), (b), and (c), a factor of $\lambda^{1/2}$ should multiply $p^{\bar{b}}(i+1|i)$, $p^f(i+1|i)$, and $p(i+1|i)$.

Chapter 16

- Eq. (16.4.24): replace $u(i, M)$ by $u(i-1, M-1)$.
- Prob. 16.6: a matrix Ψ should multiply the first two terms on the right-hand side from the left.
- Prob. 16.7: the reference is to Prob. 14.2. Also, replace $\beta_M(i)$ by $\breve{\beta}_M(i)$.
- Prob. 16.12: replace ξ_M^l by $\xi_M^l(i)$. Also, in part (b), replace a by $|a|$.
- Prob. 16.16: replace $\mathcal{V}_k(z)$ inside the sum by $\mathcal{V}_m(z)$.

Chapter 17

- Eq. (17.2.18): replace P_N by P_{N-1}.
- Prob. 17.3, recursion for w_i: replace α by α^{-1}.
- Prob. 17.5, part (a): remove ϵ from the denominator.
- Prob. 17.13, part (d): replace $\|u_i\|^2 > \epsilon > 0$ by $\|u_i\|^{-2} > \epsilon > 0$. Also, replace $w_i \to w$ by $w_i \to w^o$.
- Prob. 17.14, part (c), rephrase as follows: "Follow arguments similar to part (d) of Prob. 17.13 to conclude that $w_i \to w^o$.
- Prob. 17.15, part (b): replace μ by $\mu(i)$ inside the boxed expression.
- Prob. 17.21, part (b): min should be max.
- Prob. 17.22: in the definition of $J(w)$, remove the right-most equality that involves $v(i)$.
- Prob. 17.24, part (c), m should be M.