ERRATA in Problems (First Printing)

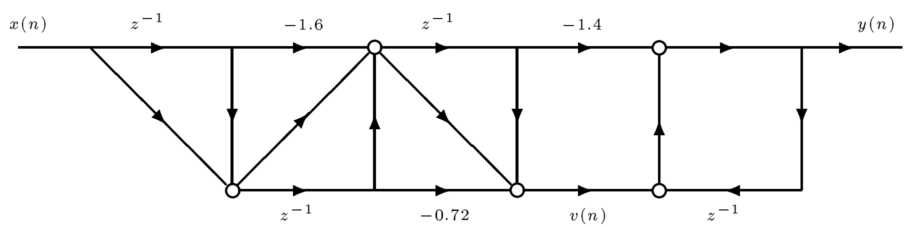
Problem 2.13: The matrix $\mathbf{A}$ should be
$$\mathbf{A} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

Problem 3.8: Define the process $x(n)$ as follows
$$x(n) = A\cos(n\omega + \phi)$$
and, in part (c), let ω be a random variable that is uniformly distributed over the interval
$$[\omega_0 - \Delta, \omega_0 + \Delta]$$
In addition, only find the power spectrum for those processes that are WSS.

Problem 4.15: The signal that is to be modeled is
$$x(n) = \delta(n) + \delta(n-1)$$
and the error that is to be minimized is
$$\mathcal{E}_{LS} = \sum_{n=0}^{\infty} [h(n) - x(n)]^2$$

Problem 5.13: The determinant of $\mathbf{R}_2$ should be
$$\det(\mathbf{R}_2) = 11$$

Problem 6.6: The lattice filter should be labeled as follows



Problem 6.13: Define
$$\phi_n(z) = z^n + a_n(1)z^{n-1} + \cdots + a_n(n-1)z + a_n(n)$$
and show that these polynomials satisfy the orthogonality property
$$\int_{-\pi}^{\pi} P_x(e^{j\omega})\phi_n(e^{j\omega})\phi_m^*(e^{j\omega})d\omega = \lambda_n \delta_{mn}$$

Problem 7.1: This problem is difficult without specific numbers for α and β. It is suggested that numbers be assigned to these parameters.

Problem 7.8: A closed-form solution cannot be found without specific numbers for A, δ, and N_0.

Problem 7.9: The given autocorrelation sequence is for $d(n)$, i.e.,
$$\mathbf{r}_d = \left[1.5,\ 0,\ 1.0,\ 0\right]^T$$

Problem 7.16: This problem should read:

The derivation of the Kalman filtering equations for real-valued signals make use of the following matrix differentiation formulas

$$\frac{d}{d\mathbf{K}}\mathrm{tr}\big(\mathbf{KA}\big) = \mathbf{A}^T$$

and

$$\frac{d}{d\mathbf{K}}\mathrm{tr}\big(\mathbf{KAK}^T\big) = 2\mathbf{KA}$$

where $\mathbf{A}$ is a *symmetric* matrix.

(a) Show that these matrix differentiation formulas are valid.

(b) Derive the equivalent expression for complex data.

(c) Use these matrix differentiation formulas to derive the expression for the Kalman gain given in Eq. (7.113).

Problem 7.17: In part (d), we should have

$$E\big\{v(1)v(2)\big\} = \rho\sigma_1\sigma_2$$

Problem 7.19: Instead $\mathbf{P}(n|n)$ we should have $\mathbf{P}(n|n-1)$, and the algebraic Ricatti equation should read

$$\mathbf{PC}^H\big(\mathbf{CPC}^H + \mathbf{Q}_v\big)^{-1}\mathbf{CP} - \mathbf{Q}_w = \mathbf{0}$$

Problem 7.22: The noise in the state equation should be $w(n)$ instead of $v(n)$ to remain consistent with the notation in the chapter, and in part (c), the expression for the Kalman gain is incorrect. The problem could be reworded as follows: "Find the steady-state Kalman gain and determine the values for $\mathbf{K}$ that correspond to the solutions for c found in part (b)."

Problem 8.7: Prove that $G_i(z)$ has a zero that approaches $z = e^{j\omega_0}$ as $\sigma_w^2/P \longrightarrow 0$.

Problem 8.30: In part (a), the constraints should be written as $\mathbf{a}^H\mathbf{u}_1 = 1$ and $\mathbf{a}^H\mathbf{u}_M = 1$. In part (d), the matrix should be Toeplitz as defined below

$$\mathbf{R}_x = \begin{bmatrix} 2 & 1-j & -j\sqrt{2} \\ 1+j & 2 & 1-j \\ j\sqrt{2} & 1+j & 2 \end{bmatrix}$$

Problem 9.8: The error should be defined by

$$e(n+l) = d(n+l) - \mathbf{w}_n^T\mathbf{x}(n+l)$$

Problem 9.12: The update equation should read

$$\mathbf{w}_{n+1} = \mathbf{w}_n + \mu e'(n)\mathbf{x}^*(n)$$

and the error should be

$$e'(n) = d(n) - \mathbf{w}_{n+1}^T\mathbf{x}(n)$$

Problem 9.17: The output of the adaptive filter should be

$$y(n) = \mathbf{w}_n^T\mathbf{x}(n)$$

Problem 9.18: In part (b), it should be given that $\mathbf{c}_n$ is independent of $\mathbf{x}(n)$.

Problem 9.27: The two equations should be

$$\mathcal{E}_a(n) = \sum_{i=0}^{n} \lambda^{n-i} |e(i)|^2 + \lambda^n \mathbf{w}_n^H \mathbf{w}_n$$

and

$$e(i) = d(i) - \mathbf{w}_n^T \mathbf{x}(i)$$