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Subject: Clarifications and Errata for
Adaptive Wireless Communications: MIMO Channels and Networks
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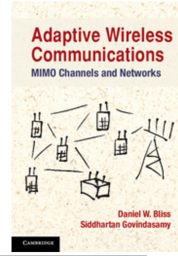

Unfortunately, in any significant work there are sources of potential confusion and occasional errors. Our apologies for those errors. As errors are identified, we will update this errata. If you find an error, please let us know (d.w.bliss@asu.edu, siddhartan.govindasamy@olin.edu). We thank those who have contributed to this errata. Please refer to Cambridge Universities Press's webpage for updates:
`http://www.cambridge.org/us/academic/subjects/engineering/wireless-communications/adaptive-wireless-communications-mimo-channels-and-networks`

1 Clarifications

1. In Equation (3.61), we use the notation $Q_{M=1}(\cdot,\cdot)$ in an attempt to be clear; however, we defined it as $Q_1(\cdot,\cdot)$ previously.
2. In Section 3.7.1, we assume a model of colored noise that is defined by covariance $\mathbf{R}$; however it is often assumed that thermal noise is spatially white, so it would be natural to interpret $\mathbf{n}$ in this case to be noise plus interference.
3. In the second to last sentence in Section 3.8.1, there is an accidental extra carriage return.
4. In Equation (3.259), the use of $\Re\{\cdot\}$ is redundant because the argument is real.
5. In Problem 3.8, the notation $\|\cdot\|$ should be used to be consistent with the rest of the textbook.
$$S_Y(f) = \|H(f)\|^2 S_X(f) \tag{3.261}$$
6. On page 133, the phrase should read "*Extended networks* are networks whose area $\cdots$" rather than "*Extended networks* are network whose the area $\cdots$".
7. On page 134, in the term $n^{\alpha/2}$, α indicates the channel exponent defined in Section 4.2.1.
8. Near the top of pate 150, it should read "The four values of the $s(t_0), s(t_1)$ pair are represented by the big circles, and all tof the potential outputs states $s(t_0), s(t_1)$ are represented by the 64 states small circles" (not the grid line intersections).
9. On page 153, $V_n(\cdot,\cdot)$ indicates the volume of the noise hypersphere, and $V_z(\cdot,\cdot)$ indicates the volume of the received signal hypersphere.
10. On page 247, in the last sentence before Section 8.3.2, it should read "It is not uncommon ..."

2 Errata

1. In the sentence above Section 2.14.5, it should read "principal branch," not "principle branch."

2. In Equation (2.112), the lower right entry of the inverted matrix should be $(\mathbf{D} - \mathbf{C}\,\mathbf{A}^{-1}\,\mathbf{B})^{-1}$.

3. The equation for power spectral density following Equation (3.124) is missing a square and should use $\|\cdot\|$ to be notationally consistent.

$$S_X(f) = \lim_{T\to\infty} \left\langle \frac{1}{T} \left\| \int_{-\frac{T}{2}}^{\frac{T}{2}} x(t)\, e^{-2\,\pi\, i\, f\, t}\, dt \right\|^2 \right\rangle$$

4. In the first sentence of 3.1.11, it should read "with values x_m," not "with value x_m."

5. Equation (3.54) is missing a $\mathbb{C}$ in the argument of the second line.

$$\begin{aligned} P^{\mathbb{C}}_{\chi^2}(q; n, \sigma^2, \nu^{\mathbb{C}}) &= \int_0^q dr\, p^{\mathbb{C}}_{\chi^2}(r; n, \sigma^2, \nu^{\mathbb{C}}) \\ &= 1 - Q_n\!\left(\sqrt{\frac{2\nu^{\mathbb{C}}}{\sigma^2}}, \sqrt{\frac{2q}{\sigma^2}}\right) . \end{aligned} \tag{3.54}$$

6. In the exponent of the exponential in Equation (3.29) the form should be $\|z-\mu\|^2$ rather than $(z-\mu)^2$.

7. Equation (3.72) is missing a square in the exponent.

$$p_{logNorm}(x; \mu, \sigma^2)\, dx = \frac{1}{x\,\sqrt{2\pi\,\sigma^2}}\, e^{-\frac{(\log x - \mu)^2}{2\sigma^2}} \tag{3.72}$$

8. Before Equation (3.125) and in the index, it should be spelled the "Einstein-Wiener-Khinchin" theorem.

9. In the first sentence of Section 3.7.2, the reference should be to Equation (3.153), not Equation (3.154).

10. There is a dropped $*$ in Equation (3.223). It should read $\mathbf{K} = \mathbf{K}_{\boldsymbol{\xi}^*,\boldsymbol{\xi}^*} = \cdots$.

11. Equation (3.230) was intended to indicated the scalar Wirtinger derivative and should read

$$\begin{aligned} \left\{\nabla_{\boldsymbol{\xi}^*} \log p(\mathbf{z}; \boldsymbol{\xi})\right\}_m &= \left\{\nabla_{\boldsymbol{\xi}^*} \left(-[\mathbf{z}^* - \boldsymbol{\mu}^*]^T\, \mathbf{R}^{-1}\, [\mathbf{z} - \boldsymbol{\mu}] - \log|\mathbf{R}|\right)\right\}_m \\ &= \left[\frac{\partial \boldsymbol{\mu}^*}{\partial \boldsymbol{\xi}^*_m}\right]^T \mathbf{R}^{-1}\, [\mathbf{z} - \boldsymbol{\mu}] + [\mathbf{z}^* - \boldsymbol{\mu}^*]^T\, \mathbf{R}^{-1} \left[\frac{\partial \boldsymbol{\mu}}{\partial \boldsymbol{\xi}^*_m}\right] \\ &\quad + [\mathbf{z}^* - \boldsymbol{\mu}^*]^T\, \mathbf{R}^{-1}\, \frac{\partial \mathbf{R}}{\partial \boldsymbol{\xi}^*_m}\, \mathbf{R}^{-1}\, [\mathbf{z} - \boldsymbol{\mu}] - \operatorname{tr}\left\{\mathbf{R}^{-1} \frac{\partial \mathbf{R}}{\partial \boldsymbol{\xi}^*_m}\right\} , \end{aligned} \tag{3.230}$$

where $\boldsymbol{\xi}_m$ indicates the m^{th} entry in $\boldsymbol{\xi}$.

12. In Equation (3.234) transposes were dropped. It should read

$$\begin{aligned} \nabla_{\boldsymbol{\xi}^*} \log p(\mathbf{z}; \boldsymbol{\xi}) &= \cdots \\ [\nabla_{\boldsymbol{\xi}} \log p(\mathbf{z}; \boldsymbol{\xi})]^T &= [\mathbf{z} - \boldsymbol{\mu}]^T\, \mathbf{R}^{-T}\, (\nabla_{\boldsymbol{\xi}^T} \boldsymbol{\mu}^*) + [\mathbf{z} - \boldsymbol{\mu}]^\dagger\, \mathbf{R}^{-1}\, (\nabla_{\boldsymbol{\xi}^T} \boldsymbol{\mu}) . \end{aligned} \tag{3.234}$$

13. In Equation (4.11), the integrand should include a $c_k^*(\tau)$, not $c_k * (\tau)$.

14. The indices in Equations (4.16)-(4.20) are confused. In the sentence before Equation (4.16), it should read "denoted by $c_{k,j}$." In Equations (4.16)-(4.18), references to index i should be replaced with k. In Equation (4.19), the left hand side of the equation should be $\mathbf{c}_i^\dagger\, \mathbf{c}_k$. Finally, in the sentence after Equation (4.20), it should read "since c_{ij} and c_{kj} are $\cdots$".

15. In Problem 5.3 part (a), the last sentence should read: Find $g[k]$ such that $y[k] = m[k]$. In Problem 5.3 part (c), the end of the last sentence should read: ... and show that $y[k] = m[k]$.

16. In Equation (7.4), The determinant of the covariance is missing. It should read

$$p(\mathbf{Z}|\underline{\mathbf{s}}, a, \phi) = \frac{1}{\pi^{n_r\, n_s}\, |\mathbf{R}|^{n_s}} e^{-\mathrm{tr}\{[\mathbf{Z}-a\,\mathbf{v}(\phi)\,\underline{\mathbf{s}}]^\dagger\, \mathbf{R}^{-1}\, [\mathbf{Z}-a\,\mathbf{v}(\phi)\,\underline{\mathbf{s}}]\}} \tag{7.4}$$

17. In Equations (8.20) and (8.21), there are sign errors in the argument.

$$\lambda_m\{\mathbf{P}\} = \left(\nu - \frac{1}{\lambda_m\{\mathbf{R}^{-1/2}\,\mathbf{H}\,\mathbf{H}^\dagger\,\mathbf{R}^{-1/2}\}}\right)^+ . \tag{8.20}$$

and

$$\sum_m \left(\nu - \frac{1}{\lambda_m\{\mathbf{R}^{-1/2}\,\mathbf{H}\,\mathbf{H}^\dagger\,\mathbf{R}^{-1/2}\}}\right)^+ = P_o\,. \tag{8.21}$$

18. The second line of Equation (8.133) has a vestigial log and is missing a matrix inverse,

$$= \frac{\partial^2}{\partial(\mathbf{A})^*_{m,n}\,\partial(\mathbf{A})_{j,k}} \mathrm{tr}\{(\mathbf{Z} - \mathbf{A}\,\mathbf{X})^\dagger\,\mathbf{R}^{-1}\,(\mathbf{Z} - \mathbf{A}\,\mathbf{X})\}\,.$$

19. The sentence after (11.31) should read: Hence, to maximize the diversity order, the codewords should be chosen to maximize the minimum rank of the matrix $\mathbf{A}_{k\,\ell}$ over all distinct k and ℓ.

20. The last sentence of Problem 11.4 should read: Using the rank and determinant criteria, find the maximum diversity and coding gain achievable with the above code.

21. Problem 11.6 should read: Use the rank and determinant criteria to determine the diversity and coding gain of the Alamouti code with n_r receiver antennas.

22. The last sentence of Problem 12.7 should read: Assume that the legacy link does not change its behavior in response to the presence of the cognitive link.

23. In the third line of Equation (17.10), there is a dropped factor of 2 that also affects Equation (17.12). They should read

$$\begin{aligned} J &= \left\langle \left(\frac{\partial \log p(\mathbf{Z}_\tau)}{\partial \tau}\right)^2 \right\rangle \\ &= \left\langle \left\| \sum_m \mathbf{n}^\dagger(mT_s)\,\mathbf{R}^{-1}\,\mathbf{H}\,\mathbf{s}'(mT_s - \tau) + h.c. \right\|^2 \right\rangle \\ &= 2\sum_m \left\langle \mathbf{n}^\dagger(mT_s)\,\mathbf{R}^{-1}\,\mathbf{H}\,\mathbf{s}'(mT_s-\tau)\,[\mathbf{s}'(mT_s-\tau)]^\dagger\,\mathbf{H}^\dagger\,\mathbf{R}^{-1}\,\mathbf{n}(mT_s)\right\rangle \\ &= 2\sum_m \mathrm{tr}\left\{\left\langle \mathbf{s}'(mT_s-\tau)\,[\mathbf{s}'(mT_s-\tau)]^\dagger\right\rangle\,\mathbf{H}^\dagger\,\mathbf{R}^{-1}\,\mathbf{H}\right\} \end{aligned} \tag{17.10}$$

and

$$\begin{aligned} J &= 2\,(2\pi)^2\,B_{rms}^2 \\ &\quad \cdot \sum_m \mathrm{tr}\left\{\left\langle \mathbf{s}(mT_s-\tau)\mathbf{s}^\dagger(mT_s-\tau)\right\rangle\,\mathbf{H}^\dagger\,\mathbf{R}^{-1}\,\mathbf{H}\right\} \\ &= 2\,(2\pi)^2\,B_{rms}^2\,n_s\,\mathrm{tr}\left\{\mathbf{P}\,\mathbf{H}^\dagger\,\mathbf{R}^{-1}\,\mathbf{H}\right\}\,. \end{aligned} \tag{17.12}$$