Errata for the 6th & 7th Printings of
"Understanding Digital Signal Processing, 2/E",
by Richard Lyons

I beg your pardon for the typographical errors in the book. It will not take long to make these corrections. I promise. - Rick Lyons

Page 7: In the third line below Eq. (1-7), the text:
"... indicate that $X_{sum}(n)$ has a frequency ...

The uppercase "$X" should be lowercase "$x" as:
"... indicate that $x_{sum}(n)$ has a frequency ...

[Found by Angela Livingstone, 3/30/08; [Production Error]

Page 23: On the right side of Eq. (2-3), the text is printed as:

$$\ldots = \sin(2\pi(f_o + \frac{1}{32})nt_s)$$ (2-3)

The fraction $\frac{1}{32}$ should be $\frac{m}{nt_s}$, making the text print as:

$$\ldots = \sin(2\pi(f_o + \frac{m}{nt_s})nt_s)$$ (2-3)

[Found by Jim Murphy [9/14/05].][Author Error]

Page 34: In the 5th line down, the text:

"... where spectral replications do not butt up against each other except at zero Hz."

is confusing. Please edit it as follows:

"... where spectral replications do not butt up against each other except at zero Hz."

[Found by Jim Murphy [9/14/05] & Justin Reeves [6/20/06].][Author Error]

Page 37: The "$f_s$" labels, within the arrows, at the very bottom of Figure 2-13 should be "$f_s/2$".

[Found by Author [6/20/06].][Author Error]

Page 38: In the fifth line up from the bottom of the page, the text:

"... where $m_{odd}$ is an odd integer[14]."

should be changed to:

"... where $m_{odd}$ is an odd integer greater than one[14]."

[Found by Jim Murphy [9/14/05] & Justin Reeves [6/20/06].][Author Error]

Page 40: In the 2nd line below Eq. (2-14), the text:
"m = 2 provide an optimum ..."

should be changed to:

"m\_even = 2 provide an optimum ...

[Found by Justin Reeves, 6/20/06.] [Author Error]

--- Page 42: In the middle of Table 2-2, on the right side, the text:

"m\_odd is any positive odd integer ...

should be changed to:

"m\_odd is an odd integer greater than one ...

[Found by Justin Reeves, 6/20/06.] [Author Error]

--- Page 48: The incorrect letter "v" in the third line of Eq. (3-4d) should be replaced with a "." multiplication symbol.

[Found by Uday Padmanabhan, 11/19/08.] [Author Error]

--- Page 49: In Equation (3-8), the \( \phi \) subscript for the \( X \) at the left-hand side is missing, and superscript after the "tan" characters should be "-1". Equation (3-8) should look like:

\[
X_\phi(m) = \tan^{-1} \left( \frac{X_{\text{max}}(m)}{X_{\text{real}}(m)} \right)
\]

(3-8)

[Found by Justin Reeves [6/19/06].] [Production Error]

--- Page 62: The second part of equation (3-18') printed as:

\[
x(n) = \frac{1}{\sqrt{N}} \sum_{n=0}^{N-1} X''(m)e^{j2\pi nm/N}
\]

(3-18')

should have the lower limit of the summation changed to "m" instead of "n", as:

\[
x(n) = \frac{1}{\sqrt{N}} \sum_{m=0}^{N-1} X''(m)e^{j2\pi nm/N}
\]

(3-18')

[Found by Larry Ong, 2/19/08.] [Author Error]

--- Page 63: On line 9, the text:

"..., that \( X(N/2+1) \), when \( m = N/2+1 \)

should be:

"..., that \( X(N/2) \), when \( m = N/2 \)"
Page 77: For both Eq. (3-29) and Eq. (3-30), the "-1" characters should be deleted from the denominator of the cosine arguments. The cosine argument, in both equations, should be:

"...cos(2\pi n/N),"

Page 93: The last term in Eqn. 3-37 has a missing minus sign in its exponent. The last term should be:

... + e^{-jq(K-1)}

Page 105: In Table 3-1, on the second row the 1st column text:

"Frequency in radians"
should be replaced with:

"Frequency in radians/second"

Page 110: In both lines of Equation (3-58) there is a missing minus sign in front of the "j" in the exponent of "e". For both lines of Eq. (3-58) the printed expression should be:

= e^{-j(2\pi n/N)...

Page 114: The label text above the arrow in Figure 3-41 states:

"... transform of x(n) ...
There is a missing "c" subscript, the arrow's label text should state:

"... transform of x_c(n) ...

Page 135: On the 3rd line from the bottom, the "1" in:

"e^{-j\pi} = 1"
should be a minus 1 as

"e^{-j\pi} = -1"

Page 143: In Figure 4-10, in the middle stage there is the number 4 on the 1st and 2nd (counting down from the top) southeast-pointing arrows. Those 4s should not be there. The 4s should be on the 3rd and 4th southeast-pointing arrows of the middle stage as shown below.
Page 163: The text on the bottom line, printed as:

"Figures 5-8(a) and 5-8(b)."

should be changed to

"Figures 5-8(b) and 5-8(c)."

Page 178: In the 3rd & 4th lines of the 1st paragraph the text printed as:

"... defined by 32 discrete samples, to which 480 zeros were ..."

should be

"... defined by 16 discrete samples, to which 496 zeros were ..."

Page 179: In the 5th line of the next to the last paragraph the text printed as:

"... by 32 discrete samples, with 480 zeros appended, ..."

should be

"... by 16 discrete samples, with 496 zeros appended, ..."

Page 198: On line 8, the text:

"... in Figure-34(b), ...

Should be:

"... in Figure 5-40(b), ..."
Page 222: In Figure 6-7(a), the label above the arrow should be

"σ = -a_0/a_1"

just as it is in Figure 6-8(a)

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 244: The normalized-frequency labeling (radians/sample) on the frequency axis of Figures 6-24(b) and 6-24(c) should be changed as:

-2π changed to -4π
-π changed to -2π
π changed to 2π
2π changed to 4π

[Found by Author, 10/17/08.] [Author Error]

Page 245: On the second line the text:

"... if Figure 6-4(a) ...

should be changed to

"... if Figure 6-24(a) ...

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 247: On the last line of the footnote, the text:

"... in Step 5."

should be changed to:

"... in Step 6."

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 257: In the eleventh line below Eq. (6-87)

"... Figure 6-21(b). Knowing that ...

should be changed to:

"... Figure 6-22(b). Knowing that ...

[Found by Yancen Li (7/14/14)]; [Author Error]

Page 264: In the 6th line of the first full paragraph, the text:

"...squeezed in toward zero Hz."

should be:

"...squeezed in toward f_s/2 Hz."

[Found by VV (vanamali), 3/12/09.] [Author Error]

Page 264: In the next to the last line of the first full paragraph there's a missing "|" vertical bar character indicating "magnitude". The text:
"...in \( |H_d(f_d)| - ...\)

should be:

"...in \( |H_d(f_d)| - ...\)

[Found by Author, 7/14/05.] [Author Error]

Page 265: In the first and third lines of the caption to Figure 6-32, the subscripted "c" in "\( f_c \)" should be an "a", as "\( f_a \)".

In the third line of the caption, the subscripted "c" in "\( H_c \)" should be an "a", as "\( H_a \)".

[Found by Author, 7/14/05.] [Author Error]

Page 267: There is a missing "\( x(n) \)" factor in Equation (6-114), the first part of that equation should be:

\[
y(n) = 0.20482712 \cdot x(n) + 0.40965424 \cdot x(n-1) + ...
\]

[Found by Kendall Castor-Perry, 5/3/09.] [Author Error]

Page 286: The feedback coefficient of the resonator in Figure 7-3, printed as:

\( e^{j\Gamma r} \)

it should be changed to:

\( e^{j\Omega r} \)

[Found by Author, 7/14/09.] [Production Error]

Page 300: In Figure 7-18(b), the feedback coefficient label on the right side of the figure printed as:

\( 2rcos(2\pi k/N) \),

the "\( \neq \)" should be replaced with "\( \pi \)" (pi), as:

"\( 2rcos(2\pi k/N) \)"

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 345: On the right side of Figure 8-8 the term \( e^{12\pi f_0 t} \) should be divided by two, making it

\( e^{12\pi f_0 t}/2. \)

[Found by John Littig, 9/24/07.] [Author Error]

Page 353: In the sentence just before Eq. (8-17), the described notion of orthogonality of \( i(n) \) and \( q(n) \) is only conditionally true. Because this orthogonality topic was not described in sufficient detail, I suggest you strike out
both the sentence just before Eq. (8-17) as well as Eq. (8-17).

[Found by Ken Walsh, 5/9/06.] [Author Error]

Page 354: In the third line from the bottom, the text:

"... about zero Hz, not $f_c$ Hz as in Figure 8-17(b)."

should have a comma inserted after "$f_c$ Hz", as:

"... about zero Hz, not $f_c$ Hz, as in Figure 8-17(b)."

(Note: The missing comma is essential because it changes the meaning of the sentence.)

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 373: In Figure 9-11, in the middle and bottom figures, the two labels within the figures printed as:

"... of $H_1(\square)$" should be changed to "... of $H_1(\omega)$"

[Found by Antoine Trux, 12/15/04.] [Author Error]

Page 379: In Item# 6, in the 2nd sentence the "cos" and "sin" subscripts printed as:

"In this case half the $h_{\sin}(k)$ coefficients are zeros, and all but one of the $h_{\cos}(k)$ coefficients are zeros!"

should be swapped making that sentence be:

"In this case half the $h_{\cos}(k)$ coefficients are zeros, and all but one of the $h_{\sin}(k)$ coefficients are zeros!"

[Found by Author [10/09/05].] [Author Error]

Page 384: The "shading" in two places at the bottom in Figure 10-3 doesn't show up in the figure.

The shading in Figure 10-3 should look like the following:
In the seventh line of the second paragraph, the text is printed as:

"The lower the attenuation, the ...".

Please change the word "lower" to "greater" so that the text reads:

"The greater the attenuation, the ...".

In Figure 13-6(c) the final $z^{-K}$ delay block should be deleted making that figure look as follows:

In Figure 13-6(b) the superscripted "-2" characters shown by the large arrows below:
 Should be changed from "-2" to "-1" making Figure 13-6(b) become:

[Found by Damon Bradley, 10/1/09.] [Author Error]

Page 484: Equation (13-10) has suffered a series of "foul-ups" in different Printings of the book. Eq. (13-10) should be:

\[
W(m) = \sum_{n=0}^{N-1} e^{-j2\pi nm/N} = \frac{\beta}{2} \sum_{n=0}^{N-1} e^{j2\pi n/N} e^{-j2\pi nm/N} = \frac{\beta}{2} \sum_{n=0}^{N-1} e^{-j2\pi n(N-1)/N}.
\]  

(13-10)

[Found by Author, 3/22/04.] [Author Error]

Page 488: Equation (13-18) has minus signs where equal signs should be. Equation (13-18) should be:

\[
x(0) = a(0) + jb(0)
x(1) = a(1) + jb(1)
x(2) = a(2) + jb(2)
\ldots
x(N-1) = a(N-1) + jb(N-1)
\]

(13-18)

[Found by Author [1/11/07].] [Production Error. Wierd. This error was NOT in the 1st Edition!]

Page 489: In the 3rd line below Eq. (13-22) change the text from:

"... in Eq. (13-40), ...

"... in Eq. (13-20), ...

[Found by Antoine Trux, 1/11/07.] [Author Error]
Page 496: In the 6th and 7th lines below Eq. (13-40) change the text from:

"... real, \( X_a(N) \) through \( X_a(2N-1) \) are merely the complex conjugates of their \( X_a(0) \) through \( X_a(N-1) \) counterparts ..."

to:

"... real, \( X_a(N+1) \) through \( X_a(2N-1) \) are merely the complex conjugates of their \( X_a(N-1) \) through \( X_a(1) \) counterparts ..."

[Found by Antoine Trux, 1/11/07.][Author Error]

I (the author) suggest you write the following in the book's margin:

\[ X_{a,\text{real}}(N) = X_r(0) - X_i(0) \]
\[ X_{a,\text{imag}}(N) = 0 \]

Page 518: For more accurate results, the "12/M" factor at the beginning of Eq. (13-70) should be changed to \( \sqrt{12/M} \). Thus Eq. (13-70) should be:

\[ y_{\text{desired}}(n) = \sqrt{\frac{12}{M}} \cdot \sigma' \left[ \frac{\sum_{k=1}^{M} x(n)}{M} - \frac{M}{2} \right] + \mu'. \]  

(13-70)

[Found by Bharat Pathak, 7/13/07.][Author Error]

Page 544: In the exponent of Eq. (13-104), originally printed as:

\[ X(k) = \sum_{n=0}^{M-1} x(n) e^{j2\pi nk/N}. \]  

(13-104)

The "\( N \)" should be changed, in two places, to an "\( M \)", making the equation print as:

\[ X(k) = \sum_{n=0}^{M-1} x(n) e^{j2\pi nk/M}. \]  

(13-104)

[Found by Author 3/13/06.][Author Error]

Page 548: 4th line below Eq. (13-107), change the text:

"... 0.26° using ...

to

"... 0.28° using ...".

For preciseness, you might note on Figure 13-59 that the error is -0.28° at True \( \theta = -45^\circ \), and the error is +0.28° at True \( \theta = +45^\circ \), as shown in the following figure.
Page 549: 4th line below Eq. (13-109'), change the text:

"... error is 0.26° for ...

to

"... error is 0.28° for ...

Page 551: In Figure 13-61(a) there needs to be a Delay element inserted just after the "Inverse" operation as shown below. The length of that (missing) Delay element should be the same length as the Delays in the I and Q input paths.

Page 560: In Figure 13-70(b), on the right side in the "Section 3, r = 1" part of the figure, there should be three stages of delay lines instead of only two stages as shown in the figure. That "Section 3, r = 1" part of the figure should look like the following:
Page 561: Equation (13-123) has a missing 1/N scale factor in front of the summation. That equation should be:

\[ M(q) = \frac{1}{N} \sum_{k=qN}^{(q+1)N-1} x(n) \]  

(13-123)

Page 569: In the right \( X_{int}(m) \) column of Table 13-8, the underline character associated with row \( m = 9 \) should be a zero "0" value as follows:

\begin{tabular}{ccc}
\( m \) & \( X_{int}(m) \) \\
\ldots & \ldots & \\
9 & 0 & \\
\ldots & \ldots & \\
\end{tabular}

Page 607: Two corrections: In the second line of Eq. (D-7), the term:

"... -\cos(\omega t) ..."

should be:

"... -\cos(2\omega t) ..."

In the third line of Eq. (D-7), the term:

"... -\frac{1}{2}(\sin(\omega t))..."

should be:

"... -\frac{1}{4}(\sin(2\omega t))..."

Page 627: The minus sign before the "0.04" value in Equation (F-5) should be deleted, making Eq. (F-5) end with:

"... = \frac{0.25}{2\pi} = 0.04 \text{ seconds.} \quad (F-5)"

Dear Reader, if you find any additional errors, no matter how trivial, please notify me at:

R.Lyons@ieee.org

I'd sure appreciate hearing from you and I promise I'll reply to your E-mail.

Thanks,