Errata for the 10th Printing 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 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.
Page 62: The second part of equation (3-18') printed as:

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

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

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

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

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

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

\[e^{j\omega r}\]

it should be changed to:

\[e^{j\omega r}\]

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

Page 345: On the right side of Figure 8-8 the term \(e^{j2\pi f_0 t}\) should be divided by two, making it
\[ e^{j2\pi f_0 t/2}. \]

[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) itself.

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

**Page 389:** 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 ...".

[Found by Mark Kolber, 1/29/08.] [Author Error]

**Page 478:** In the fifth line down, delete the text:

"...followed by another K delay..."

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

[Found by Brian Frantz, 8/8/17.] [Author Error]

**Page 479:** 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:
Page 484: Equation (13-10) has suffered a series of "foul-ups" in different Printings of the book. Eq. (13-10) should be:

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

(13-10)

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:

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

(13-70)

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 θ = -45°, and the error is +0.28° at True θ = +45°, as shown in the following figure.
"...error is 0.28° for ...".

[Found by Chris Zarowski, 4/27/06.][Author Error]

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:

![Diagram showing three stages of delay lines instead of two]

[Found by Mike Totham, 8/31/07.][Author Error]

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)

[Found by Author, 8/24/08.][Production Error]

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:

<table>
<thead>
<tr>
<th>( m )</th>
<th>( X_{int}(m) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

[Found by Author, 3/21/09.][Production Error]

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))..."

[Found by Julian Vrbancich, 10/23/12; [Author Error]
Page 610: The final ratio at the end of Eq. (D-12) MAY be printed as:
\[
\frac{(b-a)^2}{12}.
\]
Make sure the numerator looks like (with a PLUS sign):
\[
\frac{(b+a)^2}{12}.
\]
[Found by Author, 1/15/05.][Author Error]

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,
[-Rick Lyons-]