

Errata List as of May 16, 2003, for Discrete-Time Speech Signal Processing: Principles and Practice

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Acknowledgement

Thanks to my colleagues and students for helping to find various errors in the text.

Preface

- Page 17/2nd line from bottom: End-of-sentence period missing.

Chapter 1

- Page 3/6 lines from top: Change "lip" to "lips".
- Page 6/3 lines from top: Change "can be satisfactorily" to "cannot be satisfactorily".
- Page 8/Last line: Remove phrase "aimed at undermining the uncertainty principle".

Chapter 2

- Page 13/1st line after 3rd equation: Change "Moreover, if $0 \leq a \leq 1$..." to "Moreover, if $0 \leq a < 1$...".
- Page 13/2nd line after 3rd equation: Change "If $-1 \leq a \leq 0$, then ..." to "If $-1 < a \leq 0$, then ...".
- Page 20/2nd line after Equation 2.4: Change limits on integral: $\int_{-\infty}^{\infty} \rightarrow \int_{-p}^p$.
- Page 21/Equation 2.5: Right side of equation should be $\frac{1}{2}$ and should be stated in context of continuous time.
- Page 21/Equation 2.6: Right side of equation requires a magnitude-squared operation over the entire expression and should be stated in the context of continuous time. For continuous time, the frequency variable should be upper case omega, Ω .
- Page 21/1st paragraph: The discussion about the uncertainty principle should be given in context of continuous time. For discrete time, the inequality in Equation (2.5) doesn't hold*.

Take $x[n] = \mathbf{d}[n]$, then $D(x) = 0$ and $B(x) = 2p^3/3$
and therefore $D(x)B(x) = 0$. In fact, it is easy to construct
a large family of "impulse-like" discrete-time signals
whose duration is arbitrarily small and whose bandwidth
remains unbounded.

You will find a discussion of these problems in "The uncertainty principle in discrete signals" by Ishii and Furukawa, *Trans. CAS-33*, 1986, pp. 1032-1034. While Ishii and Furukawa provide the correct right side of Equation (2.5) for discrete time without changing the definitions of duration and bandwidth for continuous time, there is another viewpoint discussed in the paper by Meerkotter (Meerkotter, "On the relation between duration and bandwidth of discrete-time signals", *AEU*, Band 43 (1989), Heft 3). Here the definition of bandwidth is modified which yields

$$B(x) = \int_{-p}^p \tan^2\left(\frac{w}{2}\right) |X(w)|^2 dw$$

With this change of definition, the duration-bandwidth product is again bounded from below as given in inequality (14) of Meerkotter's paper.

For consistency, Exercise 2.5 should also be stated in continuous time.

*Thanks to Wolfgang Mecklenbrauker for this discussion.

- Page 35/Equation 2.23: The first inequality should be reversed, i.e., $\leq \rightarrow \geq$.
- Page 50/2nd line of Exercise 2.8: Change "..., as defined in Equation (2.4), ..." to "..., as defined in its discrete-time counterpart of Equation (2.4), ...".

Chapter 3

- Page 67/Equation 3.2: Index k is missing in coefficients \tilde{A} , i.e., $\tilde{A} \rightarrow \tilde{A}_k$.
- Page 94/Figure 3.28: For the "r (read)", add a small space between the tongue hump and the upper palate.
- Page 101/6 lines from top: Change "Section 4.6" to "Section 3.4.6".
- Page 102/2nd line from bottom of Exercise 3.1: " N " should be " P " and " $2N$ " should be " $2P$ ".
- Page 102/Exercise 3.2/3rd line from bottom: Change "Such small ..." to "For example, small ...".
- Page 103/Figure 3.31: The signal in Figure 3.31 should be shifted back by ϵ (epsilon), to match the expression for part (a) at the top of the page.

Chapter 4

- Page 127/1st line after top equation: Put "resonant frequencies" in italic font.
- Page 138/About $\frac{1}{4}$ down the page: To obtain Equation (4.29), we need to substitute for the backward traveling volume velocity $u_k^-(t + \mathbf{t}_k)$ at the end of

tube k rather than the forward $u_k^+(t - \mathbf{t}_k)$. Otherwise, we do not obtain Equation (4.29). So the discussion should read:

...

$$u_k^-(t + \mathbf{t}_k) = u_k^+(t - \mathbf{t}_k) - u_{k+1}^+(t) + u_{k+1}^-(t)$$

and substituting this expression for $u_k^-(t + \mathbf{t}_k)$ into the second equation of our pair ...

- Page 144/Last sentence in step S1: Change "will be" to "is".
- Page 195/Middle of page: In the denominator of the system function $H(z)$ the power of z must be $-k$.

Chapter 5

- Page 190/Line after 2nd equation: Change "normal equation" to "normal equations".
- Page 221/3rd line from bottom: Change " \mathbf{b} " to " b ", i.e., $\mathbf{b}_n's \rightarrow b_n's$.
- Page 240/1st line of Exercise 5.1: "Section 5.2.3" should be "Section 5.3.3".
- Page 240/Last line of Exercise 5.1: " N " should be " N_w ".
- Page 240/Last line of Exercise 5.1: Change "data length" to "window length".

Chapter 6

- Page 253/3rd line in 2nd paragraph: Change "component by" to "component and by".
- Page 258/5th line from end of example: Change "of the logarithm in the operators" to "of the logarithm and complex exponential in the operators".
- Page 258/Last line before figure: Remove first inner parenthesis in log, i.e., $\log[(X \rightarrow \log[X$.
- Page 268/Figure 6.11a: Remove "(dB)" on vertical axis. Do the removal only in part (a) of the figure, not part (b).
- Page 295/Example 6.15/5th line in example: Remove 2nd "then", i.e., change "... and then the ..." to "...and the ...".
- Page 304/7 lines from top: Change "Stockholm" to "Stockham, Cannon, and Ingebretsen".
- Page 307/Reference 18: Change "Stockholm" to "Stockham".

Chapter 7

- Page 310/Equation 7.1: Change " n " to " m " in exponential, i.e., $e^{-j\omega n} \rightarrow e^{-j\omega m}$.

- Page 325/Equation 7.19: Change " P " to " n " in exponential, i.e., $e^{-j\omega p} \rightarrow e^{-j\omega n}$.
- Page 328/2nd line from the bottom: Change "frequency sampling factor" to "frequency sampling interval".

Chapter 8

- Page 378/Step S2: Should read "Integrate $\hat{q}(n, \omega_k)$ (using a running sum) and then exponentiate".
- Page 387/1st line of Section 8.5.1: Change "The problem ..." to "A problem ...".
- Page 401/Figure 8.24: Add the word "Pinna" to the outer ear.
- Page 405/20 lines from top: Extend italic font to "sinewave peak".
- Page 407/Figure 8.28: Second sentence in figure caption should read "The dashed line is the wideband cochlear filter, while the solid line is the corresponding narrowband differential filter."
- Page 422: Reference [6] is out of alphabetic order; it should follow reference [10]. When corrected, corresponding references must be re-adjusted.

Chapter 9

- Page 429/5 lines above start of Section 9.2: Change word "valve" to the word "value".
- Page 446/2nd-to-last line of Example 9.8: Change "cannot be" to "should not be".
- Page 501/Reference [39]: Remove the words "Acoustics, Speech, and".

Chapter 10

- Page 503/2nd line from bottom of 1st paragraph: Make italic the words "frequency domain".

Chapter 11

- Page 542/3rd paragraph, line 6: Change "... which seek to undermine the uncertainty principle ..." to "... which we introduce also in addressing the uncertainty principle ...".

Chapter 12

- Page 604/2nd line before Example 12.2: Change " B " to " I ", i.e., $B = (11 \text{ bits}) \dots \rightarrow I = (11 \text{ bits}) \dots$
- Page 646/3rd equation: Change lower case " p " to upper case " P ", i.e., $u[n - p] \rightarrow u[n - P]$.

Chapter 14

- Page 731/Figure 14.10: The correspondence of dashed curves with figure DETs is not clear because all three dashed lines have same width and dash length. The correct curve style and width is given in the figures below.
- Page 752/6 lines from top: Change "... in this chapter's introduction." to "... in the introduction to Section 14.2."

Figure 14.10: Females-left/Males-right.

