

MUS_TECH 450 Advanced Audio Signal Processing

Readings

Abbreviations for Books and Journals

CMJ	<i>Computer Music Journal</i> , MIT Press.
COOK	Perry Cook, <i>Music Cognition, and Computerized Sound :An Introduction to Psychoacoustics</i> , MIT Press, 1999.
JAES	<i>Journal of the Audio Engineering Society</i>
LYONS	Richard Lyons, <i>Understanding Digital Signal Processing</i> , Addison-Wesley, 1997.
MOORE	F Richard Moore, <i>Elements of Computer Music</i> , Prentice Hall, 1990.
MSP	<i>Musical Signal Processing</i> , ed. by Curtis Roads, Stephen Travis Pope, Aldo Piccialli, Giovanni De Poli., Swets & Zeitlinger, 1997.
ROADS	Curtis Roads, <i>The Computer Music Tutorial</i> , MIT Press, 1996.
POHLMANN	Ken Pohlmann, <i>Principles of Digital Audio</i> , 4 th Ed., McGraw-Hill, 2000.
STEIGLITZ	Ken Steiglitz, <i>A Digital Signal Processing Primer</i> , Addison-Wesley, 1996.
STRAWN	John Strawn, <i>Digital Audio Signal Processing: An Anthology</i> , A-R, 1985.

I. Fundamentals

“Discrete Sequences and Systems” [Chapter One, LYONS]

II. Digital Filtering

Basic Concepts

“Fundamentals of Digital Filter Theory” by Julius O. Smith [CMJ, 1985]

“Digital Filters” [MOORE, section 2.4]

Filter Examples

“Digital Filter Theory, Part III, Examples and Important Special Cases” Julius O. Smith
[Chapter 2, STRAWN]

"Cookbook Formulae for audio EQ biquad filter coefficients" Robert Bristow-Johnson.
Posted to music-dsp list server.

III. Effects Revisited

Reverberation and Delay-based Effects

"Effect Design, Part 1: Reverberation and Other Filters" Jon Dattorro, [vol. 45, no. 9,
JAES]

"Effect Design, Part 2: Delay-Line Modulation and Chorus" Jon Dattorro, [vol. 45, no.
10, JAES]

"Filters, Delays, Modulations and Demodulations: A Tutorial" Pierre Dutilleux.
DAFX98 Workshop on Digital Audio Effects, Barcelona.

"Modulation and Delay Line-Based Digital Audio Effects" Sascha Disch and Udo
Zölzer. DAFX99 Workshop on Digital Audio Effects, Trondheim.

“A Hilbert-Transformer Frequency Shifter for Audio” Scott Wardle, DAFX98 Workshop
on Digital Audio Effects, Barcelona.

IV. The Fast Fourier Transform and Convolution

Using the FFT

“Fourier Analysis” Curtis Roads with Philip Greenspun [Appendix, ROADS]

"The Discrete Fourier Transform" [from Chapter 3, LYONS]

Convolution with FFTs

“Convolution,” [excerpt from Chapter 10, pp. 419-432, ROADS]

"A Generic Description of Discrete Convolution" [from Chapter 5 LYONS]

"Linear Convolution Using the Discrete Fourier Transform" from *Digital Signal Processing* by Oppenheim and Schaffer.

Tricks of the Trade

“Efficient convolution without input/output delay,” William Gardner.

“Digital Signal Processing Tricks” [Chapter 10, LYONS]

V. Spectral Processing

“Time/Pitch Changing,” [excerpt from Chapter 11, pp. 440-448, ROADS]

“Sound transformation by convolution,” Curtis Roads [MSP]

“Introducing the phase vocoder” Marie-Helene Serra [MSP]

“Spectral Mutation in Soundhack” Larry Polansky and Tom Erbe [CMJ, 1966]

VI. Perceptual Coding and Its Applications

“The Ear and How It Works” and “The Auditory Brain” by Max Mathews [Chapters 1 & 2, COOK]

“Perceptual Coding” [Chapter 10, POHLMANN]

“DVD” [Chapter 11, POHLMANN]

“Internet Audio” [Chapter 15, POHLMANN]

Appendix: Useful References to DSP Mathematics

“Tuning Forks, Phasors” [Chapter 1, STEIGLITZ]

“An Introduction to the Mathematics of Digital Signal Processing” by F. Richard Moore [Chapter One, STRAWN]

“The Arithmetic of Complex Numbers” [Appendix A, LYONS]

“Complex Signals and Negative Frequency” [Appendix C, LYONS]

“Decibels (dB and dBm)” [Appendix E, LYONS]