

Digital Audio Editing Fundamentals



Wallace Jackson

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Lompoc, California, USA

ISBN-13 (pbk): 978-1-4842-1647-7
DOI 10.1007/978-1-4842-1648-4

ISBN-13 (electronic): 978-1-4842-1648-4

Library of Congress Control Number: 2015958667

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Digital Audio Editing Fundamentals is dedicated to everyone in the open source community who is working so diligently to make professional application development software and content development tools freely available to rich application developers so that they can utilize them to achieve our creative dreams and financial goals. Last but not least, I dedicate this book to my father, Parker Jackson, my family, my life-long friends, and my production ranch neighbors for their constant help, assistance, and those relaxing, late-night BBQs!

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About the Author



Wallace Jackson has been writing for several leading multimedia publications about work in the new media content development industry, after contributing a piece about advanced-computer-processing architectures for the centerfold (a removable “mini-issue” insert) of an original issue of *AV Video Multimedia Producer* magazine that was distributed at the SIGGRAPH trade show. Wallace has written for a large number of popular publications about his work in interactive 3D and new-media-advertising campaign design, including *3DArtist* magazine, *Desktop Publisher Journal*, *CrossMedia* magazine, *Kiosk* magazine, *AV Video Multimedia Producer* magazine, *Digital Signage* magazine, and many other publications.

Wallace has authored a dozen Apress book titles, including four titles in its popular Pro Android series, Java and JavaFX game development titles, digital-image-compositing titles, and new-media-content-production titles.

In the current book on digital image compositing, he focuses on the GIMP and Photoshop CS6 digital-image-compositing software packages, and uses them to demonstrate digital-image-editing and -compositing fundamentals to beginners who wish to become digital imaging professionals.

Wallace is currently the CEO of MindTaffy Design, an agency specializing in new media content production and digital campaign design and development, located in Northern Santa Barbara County, halfway between its clientele in Silicon Valley to the north and Hollywood, the “OC,” West LA, and San Diego to the south.

MindTaffy Design has created open-source, technology-based (HTML5, JavaScript, Java, JavaFX, and Android 5.3) digital-new-media i3D content deliverables for more than a quarter century (since 1991).

The company’s clients consist of a significant number of international branded manufacturers, including Sony, Tyco, Samsung, IBM, Dell, Epson, Nokia, TEAC, Sun Microsystems, Micron, SGI, KDS USA, EIZO, CTX International, KFC, Nanao USA, Techmedia, EZC, and Mitsubishi.

■ ABOUT THE AUTHOR

Wallace received his undergraduate BA degree in business economics from the University of California at Los Angeles (UCLA) and his graduate degree in MIS business information systems design and implementation from University of Southern California in Los Angeles (USC). Wallace also received a postgraduate degree in marketing strategy from USC and completed the USC Graduate Entrepreneurship Program. He earned the two USC degrees while at USC's nighttime Marshall School of Business MBA Program, which allowed him to work full time as a COBOL programmer while completing his degrees.

About the Technical Reviewer



Chád (“Shod”) Darby is an author, instructor, and speaker in the Java development world. As a recognized authority on Java applications and architectures, he has presented technical sessions at software development conferences worldwide (in the United States, the United Kingdom, India, Russia, and Australia). In his 15 years as a professional software architect, he’s had the opportunity to work for Blue Cross/Blue Shield, Merck, Boeing, Red Hat, and a handful of start-up companies.

Chád is a contributing author to several Java books, including *Professional Java E-Commerce* (Wrox Press), *Beginning Java Networking* (Wrox Press), and *XML and Web Services Unleashed* (Sams Publishing). Chád has Java certifications from Sun Microsystems and IBM. He holds a BS in computer science from Carnegie Mellon University.

You can visit Chád’s blog at www.luv2code.com to view his free video tutorials on Java. You can also follow him on Twitter at @darbyluv2code.

Acknowledgments

I would like to acknowledge all of my fantastic editors and their support staff at Apress, who worked those long hours, and who toiled so very hard on this book, to make it the ultimate digital audio editing and compositing fundamentals book title currently in the marketplace.

I would like to specifically thank the following people:

Steve Anglin for his work as the acquisitions editor for the book and for recruiting me to write development titles at Apress covering widely popular open source content-development platforms (Android, Java, JavaFX, HTML5, CSS3, JS, GIMP, etc.).

Matthew Moodie for his work as the development editor on the book, and for his experience and guidance during the process of making the book one of the leading digital audio compositing titles.

Mark Powers for his work as the coordinating editor for the book, and for his constant diligence in making sure that I either hit my chapter delivery deadlines or far surpassed them.

Kim Burton-Weisman for her work as the copy editor on this book, for her careful attention to minute details, and for conforming the text to current Apress book writing standards.

Chád Darby for his work as the technical reviewer on the book and for making sure that I didn't make technical mistakes.

Finally, I'd like to acknowledge Oracle for acquiring Sun Microsystems and continuing to enhance Java and JavaFX, which allows their Java and JavaFX to remain the premiere open-source programming languages, and allows digital audio compositing pipelines to be written in Java code, taking this industry to the next level.

Introduction

Digital audio is currently exploding into the marketplace due to a couple of important market phenomena. The first is HD Audio, which features 24-bit, 96 kHz quality levels, and the second is a proliferation of consumer electronics genres that leverage digital audio specifically. These include digital automobile dashboards that run apps, iTVs that feature both HD and UHD high-definition screens and high-quality digital audio, home appliance devices, remote home control devices, drones, robots, affordable gaming consoles, interactive set-top boxes, digital home theater systems, home media centers, and similar new gadgetry that includes high-quality digital audio, which is what this book is all about. Of course, I will also cover your standard PCs, laptops, tablets, smartphones, e-book readers, notebooks, and netbooks that currently populate the marketplace today.

Digital Audio Editing Fundamentals was intended for HTML5 web site developers, multimedia producers, Android 6 application developers, HTML5 application developers, Java and JavaFX application developers, social media entrepreneurs, podcasters, digital audio user-interface designers, digital audio user-experience designers, or social media users of audio-centric web sites such as [SoundCloud](#), [Dubbler](#), [Eevzdrop](#), [DigiSocial](#), and [MySpace](#). In fact, just about anyone who is interested in generating high-quality, digital audio music, vocals, or other audio assets, such as special effects, delivered using popular MPEG-4, FLAC, Ogg Vorbis, WAV, AIFF, AMR, or MP3 digital audio file formats, will be interested in this *Digital Audio Editing Fundamentals* book.

This book covers digital audio editing and compositing. In the early chapters, this equates to fundamentals: terms, topics, concepts, and definitions. Every subsequent chapter builds upon the knowledge of the previous chapter, so the editing chapters in the book have readers creating advanced digital audio editing moves, using audio filters, analysis tools, and algorithms to apply special effects, create tracks, and the like.

There's even coverage at the end of this book regarding digital audio data footprint optimization, as well as creating digital audio compositing pipelines using open source platforms such as Java 8, JavaFX, HTML5, CSS3, JavaScript, Nyquist 3, and Android Studio 2.0, as well as information covering platforms and consumer electronics devices.

This digital audio fundamentals title will bring you from someone who has no real knowledge of how analog audio or digital audio works, much less how to bridge the two, to teach you about the history, concepts, and algorithms that encompass digital audio.

Chapter 1 focuses on a foundation of digital audio—the sound wave—and makes sure that you have a professional digital audio editing and compositing software package called Audacity 2.1.1 installed on your multimedia production workstation.

Chapter 2 covers the fascinating history of digital audio and the emergence of digital audio on personal computer systems with the advent of MIDI keyboards. MIDI stands for Musical Instrument Digital Interface, and you will see how it worked with synthesizer keyboards, and later sampling keyboards, until powerful modern-day sound design workstations and digital audio editors finally came into their own.

Chapter 3 covers audio data sampling, allowing the reproduction of highly accurate digital audio samples. You will learn about sample resolution and sampling frequency, as well as the mathematics of digital audio and how to use Audacity 2.1 to record your own digital audio sample data.

Chapter 4 covers digital audio transmission and the data formats that are used to stream and to play digital audio over the Internet, as well as in multimedia application development using platforms such as Android Studio, Java 8, or JavaFX, and HTML5 operating systems, such as Google's Chrome OS, Mozilla Firefox OS, Canonical Ubuntu Touch OS, Jolla Sailfish OS, Opera OS, and Tizen OS.

Chapter 5 covers the clean-up of digital audio using noise removal algorithms, as this is the first step that you want to take in your sample recording and editing work process to remove background noise and hiss, and all the extra data footprint the hiss and noise brings along.

Chapter 6 covers digital audio editor tools, including Audacity 2.1 Trimming tools, Data Selection tools, Alignment tools, and real-time audio data preview tools, such as the Digital Audio Scrubbing tools. This chapter gets you closer to the core Audacity editing tools.

Chapter 7 gets into the more manual labor (by not using any algorithms, which do editing "moves" for you). I call it "sample surgery" for fine-tuning your digital audio editing work process and for removing artifacts within your digital audio data samples, whether they are outside of your waveforms (manual editing) or an integrated part of a waveform (algorithmic editing).

Chapter 8 covers the automation of audio editing work using digital audio editing algorithms. Audacity allows hundreds of these algorithms to be added to your toolset by using plug-ins that you can download and install from the Internet. You can add processing power to your digital audio editing software any time that you feel like it.

Chapter 9 uncovers the visualization of digital audio sample data using Audacity spectral analysis tools, which use the Nyquist 3 programming language, so that more of these spectral analysis tools can be added to Audacity 2.1 using the plug-in architecture.

Chapter 10 discusses Audacity 2.1's capabilities in creating digital audio compositing pipelines using the Tracks feature, which is like the Layers feature found in digital image compositing software like GIMP 2.8 and Adobe Photoshop CS6. Audacity 2.1 Tracks allow you to layer your digital audio assets to create a complex digital audio asset creation pipeline.

Chapter 11 gets into the fascinating area of digital audio synthesis through usage of Nyquist Generator plug-ins, which I show you how to load into Audacity using Internet search. I double the amount of synthesizers in Audacity during this fun and informative chapter, making the digital audio editing software even more powerful than it is already.

Chapter 12 covers audio data footprint optimization and what the work process should be to see how much system memory your digital audio samples require, as well as how to ascertain which digital audio codec and data format is the optimal one to utilize for your multimedia production purposes.

Chapter 13 covers how all open source computer programming languages factor into digital audio compositing, both inside of Audacity 2.1.1, as well as with popular open source content delivery platforms, such as Java 8, JavaFX 8, Android Studio 2.0, HTML5, CSS3, and JavaScript, and Amazon Kindle Fire and EPUB 3 for e-book content publishing.

Chapter 14 covers content publishing platforms that support popular digital audio data formats. It also covers the different consumer electronics devices that support digital audio, including those that are most likely to support HD digital audio formats.

If you are interested in digital audio editing, synthesis, sampling, or sound design, and you want to learn the fundamentals and how everything works in the digital domain—from analog sound waves, to MIDI, to synthesis, to navigating a digital audio compositing pipeline, to special effects, to audio data spectral analysis, then this is book for you. Although it is a “fundamentals” book, it covers quite a lot of detail regarding a large spectrum (no pun intended) of digital audio concepts, work processes, terminology, content platforms, digital audio data formats, open programming languages, and digital audio content publishing opportunities.

Chock full of tips, tricks, editing tools, topics, concepts, terminology, techniques, algorithms, and work processes, this *Digital Audio Editing Fundamentals* book can help you to transition from a digital audio editing amateur to the knowledgeable digital audio synthesis, sound design, and audio compositing professional that you seek to become. Improve your digital audio editing, special effects, spectral analysis, and compositing production skills today using this complete, yet concise fundamentals title.