

# The Audio Programming Book

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[Digital Audio with Java](#) CRC Press

A guide to developing audio and process control applications with Java covers user interfaces, sound processing and filtering, and audio control sources

[Hands-On Music Generation with Magenta](#) MIT Press

"This is Volume 3 in a sequential series of bi-annual volumes, with each volume comprised of 20-25 chapters written by game audio programmers and sound designers. Basic to advanced knowledge of programming and audio integration techniques is presented. One of the goals of this book is to raise the general level of game audio programming expertise, so it is written in a manner that is accessible to beginners, while still providing valuable content for more advanced game audio programmers. The authors of the chapters will have used all of the techniques in shipping games, so readers will learn about techniques that are actually practical, with plenty of code examples and diagrams"--

[Advanced Topics in Types and Programming Languages](#) Apress

A practitioner's guide to the basic principles of creating sound effects using easily accessed free software. Designing Sound teaches students and professional sound designers to understand and create sound effects starting from nothing. Its thesis is that any sound can be generated from first principles, guided by analysis and synthesis. The text takes a practitioner's perspective, exploring the basic principles of making ordinary, everyday sounds using an easily accessed free software. Readers use the Pure Data (Pd) language to construct sound objects, which are more flexible and useful than recordings. Sound is considered as a process, rather than as data—an approach sometimes known as “procedural audio.” Procedural sound is a living sound effect that can run as computer code and be changed in real time according to unpredictable events. Applications include video games, film, animation, and media in which sound is part of an interactive process. The book takes a practical, systematic approach to the subject, teaching by example and providing background information that offers a firm theoretical context for its pragmatic stance. [Many of the examples follow a pattern, beginning with a discussion of the nature and physics of a sound, proceeding through the development of models and the implementation of examples, to the final step of producing a Pure Data program for the desired sound. Different synthesis methods are discussed, analyzed, and refined throughout.] After mastering the techniques presented in Designing Sound, students will be able to build their own sound objects for use in interactive applications and other projects

[Audio Programming for Interactive Games](#) Routledge

Program audio and sound for Linux using this practical, how-to guide. You will learn how to use DSPs, sampled audio, MIDI, karaoke, streaming audio, and more. Linux Sound Programming takes you through the layers of complexity involved in programming the Linux sound system. You 'll see the large variety of tools and approaches that apply to almost every aspect of sound. This ranges from audio codecs, to audio players, to audio support both within and outside of the Linux kernel. What You'll Learn Work with sampled audio Handle Digital Signal Processing (DSP) Gain knowledge of MIDI Build a Karaoke-like application Handle streaming audio Who This Book Is For Experienced Linux users and programmers interested in doing multimedia with Linux.

[Web Audio API](#) O'Reilly Media

Processing audio in the spectral domain has become a practical proposition for a variety of applications

in computer music, composition, and sound design, making it an area of significant interest for musicians, programmers, sound designers, and researchers. While spectral processing has been explored already from a variety of perspectives, previous approaches tended to be piecemeal: some dealt with signal processing details, others with a high-level music technology discussion of techniques, some more compositionally focused, and others at music/audio programming concerns. As author Victor Lazzarini argues, the existing literature has made a good footprint in the area but has failed to integrate these various approaches within spectral audio. In Spectral Sound Design: A Computational Approach, Lazzarini provides an antidote. Spectral Sound Design: A Computational Approach gives authors a set of practical tools to implement processing techniques and algorithms in a balanced way, covering application aspects as well the fundamental theory that underpins them, within the context of contemporary and electronic music practice. The book employs a mix of C++ for implementation, Python for prototyping, and Csound for deployment and music programming. The tight integration of these three languages as well as the wide scope offered by the combination (going from embedded to supercomputing, and including web-based and mobile applications) makes it the go-to resource to deal with the practical aspects of the subject.

[The Audio Programming Book](#) MIT Press

Created in 1985 by Barry Vercoe, Csound is one of the most widely used software sound synthesis systems. Because it is so powerful, mastering Csound can take a good deal of time and effort. But this long-awaited guide will dramatically straighten the learning curve and enable musicians to take advantage of this rich computer technology available for creating music. Written by the world's leading educators, programmers, sound designers, and composers, this comprehensive guide covers both the basics of Csound and the theoretical and musical concepts necessary to use the program effectively. The thirty-two tutorial chapters cover: additive, subtractive, FM, AM, FOF, granular, wavetable, waveguide, vector, LA, and other hybrid methods; analysis and resynthesis using ADSYN, LP, and the Phase Vocoder; sample processing; mathematical and physical modeling; and digital signal processing, including room simulation and 3D modeling. CDs for this book are no longer produced. To request files, please email [digitalproducts-cs@mit.edu](mailto:digitalproducts-cs@mit.edu).

[Computer Music Instruments II](#) Courier Dover Publications

The Audio Expert is a comprehensive reference that covers all aspects of audio, with many practical, as well as theoretical, explanations. Providing in-depth descriptions of how audio really works, using common sense plain-English explanations and mechanical analogies with minimal math, the book is written for people who want to understand audio at the deepest, most technical level, without needing an engineering degree. It's presented in an easy-to-read, conversational tone, and includes more than 400 figures and photos augmenting the text. The Audio Expert takes the intermediate to advanced recording engineer or audiophile and makes you an expert. The book goes far beyond merely explaining how audio "works." It brings together the concepts of audio, aural perception, musical instrument physics, acoustics, and basic electronics, showing how they're intimately related. Describing in great detail many of the practices and techniques used by recording and mixing engineers, the topics include video production and computers. Rather than merely showing how to use audio devices such as equalizers and compressors, Ethan Winer explains how they work internally, and how they are spec'd and tested. Most explanations are platform-agnostic, applying equally to Windows and Mac operating systems, and to most software and hardware. TheAudioExpertbook.com, the companion website, has audio and video examples to better present complex topics such as vibration and resonance. There are also videos demonstrating editing techniques and audio processing, as well as interviews with skilled musicians demonstrating their instruments and playing techniques.

[Designing Sound](#) Apress

For intermediate programmers, beginning sound designers. Sound gives your native, web, or mobile apps that extra dimension, and it's essential for games. Rather than using canned samples from a sample library, learn how to build sounds from the ground up and produce them for web projects using the Pure Data programming language. Even better, you'll be able to integrate dynamic sound environments into your native apps or games--sound that reacts to the app, instead of sounding the same every time. Start your journey as a sound designer, and get the power to craft the sound you put into your digital experiences. Add sound effects or music to your web, Android, and iOS apps and games--sound that can react to changing environments or user input dynamically (at least in the native apps). You can do all this with Pure Data, a visual programming language for

digital sound processing. Programming Sound with Pure Data introduces and explores Pure Data, building understanding of sound design concepts along the way. You'll start by learning Pure Data fundamentals and applying them, creating realistic sound effects. Then you'll see how to analyze sound and re-create what you hear in a recorded sample. You'll apply multiple synthesis methods to sound design problems. You'll finish with two chapters of real-world projects, one for the web, and one for an iOS and Android app. You'll design the sound, build the app, and integrate effects using the libpd library. Whether you've had some experience with sound synthesis, or are new to sound design, this book is for you. These techniques are perfect for independent developers, small shops specializing in apps or games, and developers interested in exploring musical apps.

[The Pragmatic Programmer](#) Taylor & Francis

This book is divided into two parts. The chapters in Part I offer a comprehensive introduction to the C language and to fundamental programming concepts, followed by an explanation of realtime audio programming, including audio synthesis and processing. The chapters in Part II demonstrate how the object-oriented programming paradigm is useful in the modelling of computer music instruments, each chapter shows a set of instrument components that are paired with key C++ programming concepts. Ultimately the author discusses the development of a fully-fledged object-oriented library. Together with its companion volume, Computer Music Instruments: Foundations, Design and Development, this book provides a comprehensive treatment of computational instruments for sound and music. It is suitable for advanced undergraduate and postgraduate students in music and signal processing, and for practitioners and researchers. Some understanding of acoustics and electronic music would be helpful to understand some applications, but it's not strictly necessary to have prior knowledge of audio DSP or programming, while C / C++ programmers with no experience of audio may be able to start reading the chapters that deal with sound and music computing.

[Game Audio Programming Pragmatic Bookshelf](#)

Designing Audio Effect Plugins in C++ presents everything you need to know about digital signal processing in an accessible way. Not just another theory-heavy digital signal processing book, nor another dull build-a-generic-database programming book, this book includes fully worked, downloadable code for dozens of professional audio effect plugins and practically presented algorithms. Sections include the basics of audio signal processing, the anatomy of a plugin, AAX, AU and VST3 programming guides; implementation details; and actual projects and code. More than 50 fully coded C++ audio signal-processing objects are included. Start with an intuitive and practical introduction to the digital signal processing (DSP) theory behind audio plug-ins, and quickly move on to plugin implementation, gain knowledge of algorithms on classical, virtual analog, and wave digital filters, delay, reverb, modulated effects, dynamics processing, pitch shifting, nonlinear processing, sample rate conversion and more. You will then be ready to design and implement your own unique plugins on any platform and within almost any host program. This new edition is fully updated and improved and presents a plugin core that allows readers to move freely between application programming interfaces and platforms. Readers are expected to have some knowledge of C++ and high school math.

[because I said I would](#). CRC Press

Computers are at the center of almost everything related to audio. Whether for synthesis in music production, recording in the studio, or mixing in live sound, the computer plays an essential part. Audio effects plug-ins and virtual instruments are implemented as software computer code. Music apps are computer programs run on a mobile device. All these tools are created by programming a computer. Hack Audio: An Introduction to Computer Programming and Digital Signal Processing in MATLAB provides an introduction for musicians and audio engineers interested in computer programming. It is intended for a range of readers including those with years of programming experience and those ready to write their first line of code. In the book, computer programming is used to create audio effects using digital signal processing. By the end of the book, readers implement the following effects: signal gain change, digital summing, tremolo, auto-pan, mid/side processing, stereo widening, distortion, echo, filtering, equalization, multi-band processing, vibrato, chorus, flanger, phaser, pitch shifter, auto-wah, convolution and algorithmic reverb, vocoder, transient designer, compressor, expander, and de-esser. Throughout the book, several types of test signals are synthesized, including: sine wave, square wave, sawtooth wave, triangle wave, impulse train, white noise, and pink noise. Common visualizations for signals and audio effects are created including: waveform, characteristic curve, goniometer, impulse response, step response, frequency spectrum, and spectrogram. In total, over 200 examples are provided with completed code demonstrations.

[Designing Audio Effect Plugins in C++](#) MIT Press

This is the de facto resource on interactive sound and music creation for Windows, this book covers topics

important to musicians and sound designers.

[Learning Core Audio](#) Simon and Schuster

Welcome to the second volume of *Game Audio Programming: Principles and Practices* — the first series of its kind dedicated to the art of game audio programming! This volume features more than 20 chapters containing advanced techniques from some of the top game audio programmers and sound designers in the industry. This book continues the tradition of collecting more knowledge and wisdom about game audio programming than any other volume in history. Both audio programming beginners and seasoned veterans will find content in this book that is valuable, with topics ranging from extreme low-level mixing to high-level game integration. Each chapter contains techniques that were used in games that have shipped, and there is a plethora of code samples and diagrams. There are chapters on threading, DSP implementation, advanced middleware techniques in FMOD Studio and Audiokinetic Wwise, ambiences, mixing, music, and more. This book has something for everyone who is programming audio for a game: programmers new to the art of audio programming, experienced audio programmers, and those souls who just got assigned the audio code. This book is for you!

[Programming for Musicians and Digital Artists](#) CRC Press

An encyclopedic handbook on audio programming for students and professionals, with many cross-platform open source examples and a DVD covering advanced topics. This comprehensive handbook of mathematical and programming techniques for audio signal processing will be an essential reference for all computer musicians, computer scientists, engineers, and anyone interested in audio. Designed to be used by readers with varying levels of programming expertise, it not only provides the foundations for music and audio development but also tackles issues that sometimes remain mysterious even to experienced software designers. Exercises and copious examples (all cross-platform and based on free or open source software) make the book ideal for classroom use. Fifteen chapters and eight appendixes cover such topics as programming basics for C and C++ (with music-oriented examples), audio programming basics and more advanced topics, spectral audio programming; programming Csound opcodes, and algorithmic synthesis and music programming. Appendixes cover topics in compiling, audio and MIDI, computing, and math. An accompanying DVD provides an additional 40 chapters, covering musical and audio programs with micro-controllers, alternate MIDI controllers, video controllers, developing Apple Audio Unit plug-ins from Csound opcodes, and audio programming for the iPhone. The sections and chapters of the book are arranged progressively and topics can be followed from chapter to chapter and from section to section. At the same time, each section can stand alone as a self-contained unit. Readers will find *The Audio Programming Book* a trustworthy companion on their journey through making music and programming audio on modern computers.

[Game Audio Programming 2](#) CRC Press

A guide to interactive audio programming covers such topics as DirectX Audio, hardware filters and effects, audio decompression libraries, and alternative file formats and SDKs.

[Game Audio Programming 3](#) Packt Publishing Ltd

This text shows how the game programmer can create a software system which enables the audio content provider to keep direct control over the composition and presentation of an interactive game soundtrack. This system is described with case studies, all source codes for which are provided on the CD-ROM.

[Audio Processes](#) Academic Press is

Effective visualization is the best way to communicate information from the increasingly large and complex datasets in the natural and social sciences. But with the increasing power of visualization software today, scientists, engineers, and business analysts often have to navigate a bewildering array of visualization choices and options. This practical book takes you through many commonly encountered visualization problems, and it provides guidelines on how to turn large datasets into clear and compelling figures. What visualization type is best for the story you want to tell? How do you make informative figures that are visually pleasing? Author Claus O. Wilke teaches you the elements most critical to successful data visualization. Explore the basic concepts of color as a tool to highlight, distinguish, or represent a value Understand the importance of redundant coding to ensure you provide key information in multiple ways Use the book 's visualizations directory, a graphical guide to commonly used types of data visualizations Get extensive examples of good and bad figures Learn how to use figures in a document or report and how employ them effectively to tell a compelling story

[Spectral Music Design](#) Springer

Informal, easy-to-understand introduction covers phasors and tuning forks, wave equation, sampling and quantizing, feedforward and feedback filters, comb and string filters, periodic sounds, transform methods, and filter design. 1996 edition.

[Introduction to Audio Analysis](#) Addison-Wesley Professional

The professional recording industry is rapidly moving from a hardware paradigm (big studios with expensive gear) to a software paradigm, in which lots of expensive hardware is replaced with a single computer loaded with software plug-ins. Complete albums are now being recorded and engineered "inside the box"-all within a computer without hardware processing or mixing gear. Audio effect plug-ins, which are small software modules

that work within audio host applications, like Avid Pro Tools, Apple Logic, Ableton Live, and Steinberg Cubase, are big business. *Designing Audio Effect Plug-Ins in C++* gives readers everything they need to know to create real-world, working plug-ins in the widely used C++ programming language. Beginning with the necessary theory behind audio signal processing, author Will Pirkle quickly gets into the heart of this implementation guide, with clearly-presented, previously unpublished algorithms, tons of example code, and practical advice. From the companion website, readers can download free software for the rapid development of the algorithms, many of which have never been revealed to the general public. The resulting plug-ins can be compiled to snap in to any of the above host applications. Readers will come away with the knowledge and tools to design and implement their own audio signal processing designs. Learn to build audio effect plug-ins in a widely used, implementable programming language-C++ Design plug-ins for a variety of platforms (Windows and Mac) and popular audio applications Companion site gives you fully worked-out code for all the examples used, free development software for download, video tutorials for the software, and examples of student plug-ins complete with theory and code

[Fundamentals of Data Visualization](#) Springer Science & Business Media

An encyclopedic handbook on audio programming for students and professionals, with many cross-platform open source examples and a DVD covering advanced topics. This comprehensive handbook of mathematical and programming techniques for audio signal processing will be an essential reference for all computer musicians, computer scientists, engineers, and anyone interested in audio. Designed to be used by readers with varying levels of programming expertise, it not only provides the foundations for music and audio development but also tackles issues that sometimes remain mysterious even to experienced software designers. Exercises and copious examples (all cross-platform and based on free or open source software) make the book ideal for classroom use. Fifteen chapters and eight appendixes cover such topics as programming basics for C and C++ (with music-oriented examples), audio programming basics and more advanced topics, spectral audio programming; programming Csound opcodes, and algorithmic synthesis and music programming. Appendixes cover topics in compiling, audio and MIDI, computing, and math. An accompanying DVD provides an additional 40 chapters, covering musical and audio programs with micro-controllers, alternate MIDI controllers, video controllers, developing Apple Audio Unit plug-ins from Csound opcodes, and audio programming for the iPhone. The sections and chapters of the book are arranged progressively and topics can be followed from chapter to chapter and from section to section. At the same time, each section can stand alone as a self-contained unit. Readers will find *The Audio Programming Book* a trustworthy companion on their journey through making music and programming audio on modern computers.