

Preface

This is a book about using electronic techniques to record, synthesize, process, and analyze musical sounds, a practice which came into its modern form in the years 1948-1952, but whose technological means and artistic uses have undergone several revolutions since then. Nowadays most electronic music is made using computers, and this book will focus exclusively on what used to be called “computer music”, but which should really now be called “electronic music using a computer”.

Most of the computer music tools available today have antecedents in earlier generations of equipment. The computer, however, is relatively cheap and the results of using one are easy to document and re-create. In these respects at least, the computer makes the ideal electronic music instrument—it is hard to see what future technology could displace it.

The techniques and practices of electronic music can be studied (at least in theory) without making explicit reference to the current state of technology. Still, it’s important to provide working examples. So each chapter starts with theory (avoiding any reference to implementation) and ends with a series of examples realized in a currently available software package.

The ideal reader of this book is anyone who knows and likes electronic music of any genre, has plenty of facility with computers in general, and who wants to learn how to make electronic music from the ground up, starting with the humble oscillator and continuing through sampling, FM, filtering, waveshaping, delays, and so on. This will take plenty of time.

This book doesn’t take the easy route of recommending pre-cooked software to try out these techniques; instead, the emphasis is on learning how to use a general-purpose computer music environment to realize them yourself. Of the several such packages available, we’ll use Pd, but that shouldn’t stop you from using these same techniques in other environments such as Csound or Max/MSP.

To read this book you must understand mathematics through intermediate algebra and trigonometry; starting in Chapter 7, complex numbers

also make an appearance, although not complex analysis. (For instance, complex numbers are added, multiplied, and conjugated, but there are no complex exponentials.) A review of mathematics for computer music by F. Richard Moore appears in [Str85, pp. 1-68].

Although the “level” of mathematics is not high, the mathematics itself is sometimes quite challenging. All sorts of cool mathematics is in the reach of any student of algebra or geometry. In the service of computer music, for instance, we’ll run into Bessel functions, Chebychev polynomials, the Central Limit Theorem, and, of course, Fourier analysis.

You don’t need much background in music as it is taught in the West; in particular, Western written music notation is not needed. Some elementary bits of Western music theory are used, such as the tempered scale, the A-B-C system of naming pitches, and terms like “note” and “chord”. Also you should be familiar with terms of musical acoustics such as sinusoids, amplitude, frequency, and the overtone series.

Each chapter starts with a theoretical discussion of some family of techniques or theoretical issues, followed by a series of examples realized in Pd to illustrate them. The examples are included in the Pd distribution, so you can run them and/or edit them into your own spinoffs. In addition, all the figures were created using Pd patches, which appear in an electronic supplement. These aren’t carefully documented but in principle could be used as an example of Pd’s drawing capabilities for anyone interested in that.

I would like to thank some people who have made it possible for me to write this. Barry Vercoe is almost entirely responsible for my music education. Meanwhile I was taught mathematics by Wayne Holman, Samuel Greitzer, Murray Klamkin, Gian-Carlo Rota, Frank Morgan, Michael Artin, Andrew Gleason, and many others. Phil White taught me English and Rosie Paschall visual composition. Finally, my parents (one deceased) are mighty patient; I’m now 47. Thank you.