Preface

Just two decades ago, computer music was an infant discipline known to only a few practitioners. This volume is evidence that the field has developed considerably since that time.

Fresh interest continues to converge on the art, science, and technology of computer music from people with a wide spectrum of skills and aesthetic visions. It is this growing interest that prompted us to prepare this book. Specifically, this volume satisfies the many requests we have received for articles from the first three volumes of *Computer Music Journal*. Many of those seminal papers were rapidly becoming unobtainable. We welcome the opportunity to make revised and updated versions of these classic papers available in book form.

Many articles in this collection can be read without a great deal of computer music background. For the student, we have also prepared *Computer Music Tutorial* (MIT Press, 1985), which provides the necessary foundation for the more advanced papers assembled here.

Computer music is an intrinsically multidisciplinary activity, as this volume demonstrates. An awareness of both the powers and the limitations of the various subdisciplines within computer music is essential for those studying the field. The composer who does not take the time to understand the underlying technical foundations of computer music will see only the surface of its full potential. Technical experts can be subject to a similar myopia in ignoring new musical developments. Products of software and hardware engineering that rely on archaic or inflexible concepts of music only nullify their own usefulness. Ultimately, musicians will bypass such designs for those that incorporate a broader and deeper sense of the musical experience.

Thus, from the standpoint of the person entering the field, learning several subdisciplines is a reasonable goal. In general, practitioners of computer music acquire detailed knowledge of a few subdisciplines and attain a good understanding and familiarity with most of the others.

We have divided this volume into four parts on the basis of an informal classification of the articles. The parts are entitled Digital Sound-Synthesis Techniques, Synthesizer Hardware and Engineering, Software Systems for Music, and Perception and Digital Signal Processing. The classification of articles into the parts is informal in the sense that many articles overlap several categories. Since it is expected that most readers will orient themselves, skip to the part that covers their immediate interest, and proceed through selected articles thereafter, each part has been made self-

contained, with its own overview. The overview sums up the contents of a part, places it in historical perspective, and refers to related articles in other parts.

Part I begins with a look at sound-synthesis techniques. A synthesis technique is essentially a model (often expressed as a formula) for generating sound. Such models are often based on natural sounds, but other models can be used as well. Musical sound synthesis by computer (or computer-controlled digital synthesizers) remains one of the most active areas of research and experimentation.

Every digital process involving sound takes place on some actual machine. As part II demonstrates, knowing the engineering constraints (both the limitations and the capabilities) underlying signal-processing computers can be essential to the effective realization of a musical idea. Synthesizers may also incorporate algorithms for sound analysis and signal processing in their internal architecture. Many issues in real-time computation and musical interaction are directly confronted in the design of a digital synthesizer.

Software systems for music—the subject of part III—integrate all the necessary score- and sound-processing software and hardware into a usable package. Programming a music system is a formidable job, especially when the goals include musical flexibility and ease of use. Programmers must continually balance the often conflicting constraints of computational efficiency and software complexity. The range of implemented software systems for music is broad, including languages for controlling synthesis hardware as well as systems to assist the composer in compositional tasks.

As the articles in part IV make clear, sound analysis by computer (or by a computer-controlled digital signal processor) can lead to useful insights in acoustics and musical perception. This, in turn, can lead to practical applications in the design of more convincing sound-processing effects. Musical composition itself may be influenced by the results of perceptual research as composers learn to manipulate musical structure in perceptual terms.

Within a single volume it would be impossible to do justice to the breadth of computer music activities. This volume concentrates mostly on the technical side of computer music, leaving the artistic side to be covered in other publications and in the music. But even the technical aspects of computer music are too broad to cover fully in a collection of this size. We

have limited this book to articles from the first three volumes of *Computer Music Journal*, with the exception of the paper by R. Cann, part of which appeared in issue 4(1). Later issues of *Computer Music Journal* can be obtained from The MIT Press and can be found in many libraries. These issues explore many important topics not covered here.