Guide to Computing for Expressive Music Performance

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Editors

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Springer

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Preface

Overview and Goals

In the early 1980s, the seeds of a problem were sown as a result of synthesizers being developed and sold with built-in sequencers. The introduction of MIDI into this equation led to an explosion in the use of sequencers and computers, thanks to the new potential for connection and synchronization. These computers and sequencers performed their stored tunes in perfect metronomic time, a performance which sounded robotic. They sounded robotic because human performers normally perform expressively – for example, speeding up and slowing down while playing, and changing how loudly they play.

The performer's changes in tempo and dynamics allow them to express a fixed score – hence the term expressive performance. However, rather than looking for ways to give the music performances more humanlike expression, pop performers developed new types of music, such as synthpop and dance music, that actually utilized this metronomic perfection to generate robotic performances.

Outside of pop, the uptake of sequencers for performance (as opposed to for composition) was less enthusiastic, except for occasional novelties like Snowflakes Are Dancing by Tomita; computer performance of classical music was a rarity. In the last 25 years, this situation has slowly been changing. Not only has computer performance becoming commonplace, but there has been much progress in learning how such computers can perform more expressively so that they sound less "machinelike". Now there is a thriving research community investigating computer systems for expressive music performance (CSEMPs).

This handbook attempts to provide a broad guide on fundamental ideas as well as recent research on computing for expressive performance. The book aims to cover some of the key issues and a number of the most influential systems from the history of computing for expressive music performance.

Organization and Features

The book is divided into nine chapters, each of which broadly covers a key area or system in computer for expressive music performance. Chapter 1 is an overview of the topic, covering a significant number of the CSEMPs from the last 30 years (including briefs on some which are later covered in more detail in the book). The CSEMPs are classified in this chapter by certain approaches, and a generic CSEMP architecture is introduced. The CSEMPs are also evaluated using a subjective classification scoring to help give perspective. A more recent issue is introduced toward the end of this chapter – that of combined systems for expressive music performance and computer composition. Chapter 2 introduces a key element not discussed in Chap. 1's overview – real-time interactivity in computing for expressive music performance, an example of which is simulated conducting systems. Chapter 3 introduces an actual example system in detail – based on probabilistic methods – one which has won a competition for its successful music performances. Chapter 4 covers a second CSEMP in detail, one using a very different approach to the probabilistic method in the previous chapter – evolutionary computing. Chapter 5 introduces a system that – unlike most CSEMPs – is not focused on classical music but on expressive performance of violin folk music. Another factor covered in some detail in Chap. 5 is the issue of synthesizing non-piano performances expressively. Most CSEMPs have focused on piano music due to its relative simplicity and advanced synthesis technology available. Chapter 6 addresses the technical problems found in polyphonic music expression from a statistical modelling point of view.

Having covered most of the core topics in computing for expressive music performance by this point, the more complex issue of evaluation of such systems is introduced in Chap. 7, mainly through discussion of the most influential CSEMP, the KTH system. Chapter 8 also addresses a more advanced topic, once again through a specific computer system. The topic is automated analysis of musical structure, which by now the reader will have realized is at the core of computing for expressive music performance. The chapter also touches on the idea discussed in Chap. 1 of a system which can be used both for expressive music performance and computer composition. The final chapter, Chap. 9, looks toward the future with the newer area of embodied expressive musical performance – building robots to expressively perform music with traditional instruments.

By the end of the book, the reader should be aware of all the key issues in computing for expressive music performance, the history of the research, a significant number of the systems available today, and the key directions for future research.

Target Audience

This book has a broad target audience. Although some of the chapters are fairly advanced, undergraduate students in computing will find much they can learn here about the field. Certainly postgraduate students and professional researchers in and

out of academia will be able to use this as a resource to learn about and reference the field of computer for expressive music performance. A number of the chapters, for example, Chaps. 1 and 2, can be read by people with only a little technical background – for example, music undergraduates – and provide significant understanding and overview. Popular and classical music practitioners can find much inspiration here for novel direction.

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