Chapter 1
A Tale of Four Moguls: Interviews with Quincy Jones, Karlheinz Brandenburg, Tom Silverman, and Jay L. Cooper

Newton Lee

MP3 and peer-to-peer file sharing technology single-handedly disrupted the age-old music business. iTunes and YouTube have displaced record stores and MTV. If we take the cue from Netflix which has successfully produced original content, it will not be long before Apple and Google will sign new artists and rival the record labels.

1.1 Interview with Quincy Jones

Quincy Jones, who composed more than 40 major motion picture and television scores, has earned international acclaim as producer of the best-selling album of all time—Michael Jackson’s *Thriller*—which has sold more than 110 million copies worldwide. Jones was also the producer and conductor of the charity song “We Are the World.”

The all-time most nominated Grammy artist with a total of 79 nominations and 27 wins, Jones has also received an Emmy Award, 7 Oscar nominations, the Academy of Motion Picture Arts and Sciences’ Jean Hersholt Humanitarian Award, the Ahmet Ertegun Award for Lifetime Achievement, and the Grammy Legend Award. He was inducted into the Rock & Roll Hall of Fame in 2013.

On November 25, 2003, I had the honor to interview Quincy Jones at his then residence at 1100 Bel Air Place. With the assistance of my colleagues Eric Huff, Brett Hardin, and Laura Knight, we took our video cameras and lighting equipment to the three-story wood-and-brick house, checked in with the security guards, and met with a big warm welcome from Quincy Jones (see Fig. 1.1).

The following is a transcript of the video interview with Quincy Jones (Lee 2004a):

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Chapter 2
Getting on the Billboard Charts: Music Production as Agile Software Development

Newton Lee

Computers and music are converging in a new era of digital Renaissance as more and more musicians such as will.i.am are learning how to code while an increasing number of software programmers are learning how to play music.

2.1 Music Appreciation and Songwriting

I dabbled with music composition before I learned computer programming. When I was in high school, one of my best friends, Kai Ton Chau, and I would go to the Hong Kong Arts Centre on the weekends and listened to hours of classical music. My appreciation of music grew from passive listening to active songwriting. For the high school yearbook, Chau and I decided to write a song together. Inspired by Rodgers and Hammerstein, he composed the music and I wrote the lyrics. The resulting sheet music was published in the yearbook.

Although I majored in electrical engineering and computer science during college years, my songwriting hobby did not dwindle over time. On the contrary, as soon as I landed my first full-time job at AT&T Bell Laboratories, I bought a professional Roland synthesizer and hooked it up to a Macintosh SE computer loaded with all the best music composition software at the time. I would write melodies and my vocal teacher Josephine Clayton would arrange the music.

As the founding president of Bell Labs’ Star Trek in the Twentieth Century Club, I produced the first-ever “Intergalactic Music Festival” to showcase international songs and cultural dances performed by fellow AT&T employees. Indeed, music abounds in the Star Trek universe: Leonard Nimoy wrote and performed the song “Maiden Wine” in the original Star Trek episode “Plato’s Stepchildren,” and he
This chapter investigates one of the more enigmatic aspects of record production: producing. In particular, it considers how producers influence the sonic attributes of vocal recordings and how technology intersects with the act of producing. The producer’s actions, though they remain poorly understood, have long been deemed a necessary part of music recording. Producers advise and sometimes outright direct the creation of “the sound” of a recording, meaning they shape not one particular performance or aspect it but each aspect so all the different sounds fit together. Producers work on individual parts, but with the whole always in view. This attention leads ideally to a coherent listening experience for the audience. Some parts are exceedingly ephemeral, such as the attributes of the recorded voice. Yet the voice, with its exceptional malleability, provides essential glue for piecing together coherent wholes.

The nature and function of these vocal attributes and even more generally the attributes that constitute “the sound” of a recording remain topics for debate and research. The importance of the producer’s contribution to their creation, however, is uncontested, and extensively documented in music history books and the sales charts of the recording industry’s trade press. Producers were present in the earliest recording sessions (e.g. Fred Gaisburg and Walter Legge), and there is no hint of them disappearing soon. To the contrary, the role of the producer in recording is evolving and expanding. According to Frith, rock criticism reveals the indicators of change. “If producers were always implicitly involved in the rock story, their role is now being made explicit.” (Frith 2012, p. 221) Increasingly, producers are credited as the central artistic force in productions, and increasingly, musicians self identify as producers and/or self-produce. For these reasons alone, producing deserves greater attention. In addition, technology is pressing the issue. New technologies enable but also encroach on existing production methods and techniques.

The producer’s expertise is not only ill defined, but it also varies greatly among practitioners; some producers being more musically literate, others more technical, some very business minded, others almost shamanistic in their approach to leading
4.1 Introduction

The dawn of the information and electronics age has had a significant impact on music. Digital music creation has become a popular alternative to playing classical instruments, and in its various forms has taken a place as full-fledged class of instrument in its own right. Research into technological or digital instruments for musical expression is a fascinating field which, among other things, tries to facilitate musicians and to improve the art of musical expression. Such instruments broaden the available forms of musical expression and provide new modes for expression, described by some as a reinvention of the musician’s proprioceptive perception (Benthien 2002; Kerckhove 1993). They can make musical expression and musical collaboration more accessible to non-musicians and/or serve as educational tools. Technology can also eliminate the boundaries of space and time in musical collaboration or performance, or enhance it, by providing new channels of interaction between performers or between performer and audience. Furthermore, technology in itself can be a collaborating partner in the form of a creative agent, co-authoring, helping or teaching its user. Finally, Beilharz brings forward the human desire for post-humanism and cyborgism in musical expression as a goal in itself to explore mediating technologies (Beilharz 2011). In this chapter we will survey music technology through various lenses, exploring the qualities of technological instruments as tools, media and agents and investigating the micro-coordination processes that occur in musical collaboration, with the long range goal of creating better technological artifacts for music expression.
Chapter 5
Improvising with Digital Auto-Scaffolding:
How Mimi Changes and Enhances the Creative Process

Isaac Schankler, Elaine Chew and Alexandre R. J. François

5.1 Introduction

This chapter examines the creative process when a human improviser or operator works in tandem with a machine improviser to create music. The discussions are situated in the context of musicians’ interactions with François’ Multimodal Interaction for Musical Improvisation, also known as Mimi (François et al. 2007; François 2009).

We consider the questions: What happens when machine intelligence assists, influences, and constrains the creative process? In the typical improvised performance, the materials used to create that performance are thought of as tools in service of the

Chapter 6
Delegating Creativity: Use of Musical Algorithms in Machine Listening and Composition

Shlomo Dubnov and Greg Surges

6.1 Introduction

In the recent years the ability of computers to characterize music by learning rules directly from musical data has led to important changes in the patterns of music marketing and consumption, and more recently also adding semantic analysis to the palette of tools available to digital music creators. Tools for automatic beat, tempo, and tonality estimation provide matching and alignment of recordings during the mixing process. Powerful signal processing algorithms can change the duration and pitch of recorded sounds as if they were synthesized notes. Generative mechanisms allow randomization of clip triggers to add more variation and naturalness to what otherwise would be a repetitive, fixed loop. Moreover, ideas from contemporary academic music composition, such as Markov chains, granular synthesis and other probabilistic and algorithmic models slowly find their way in, crossing over from experimental academic practices to mainstream popular and commercial applications. Procedurally generated computer game scores such as the one composed by Brian Eno for Maxis’ 2008 “Spore” and albums such as Björk’s 2011 “Biophilia”—in which a traditional album was paired with a family of generative musical iPad “apps”—are some recent examples of this hybridization (Electronic Arts 2013).

These developments allow composers to delegate larger and larger aspects of music creation to the machines. Accommodating this trend requires developing novel approaches to music composition that allow specification of desired musical outcomes on a higher meta-creative level. With the introduction of such sophisticated software models into the process of music production, we face new challenges to our traditional understanding of music. In music research, new evidence establishes
Chapter 7
Machine Listening of Music

Juan Pablo Bello

7.1 Introduction

The analysis and recognition of sounds in complex auditory scenes is a fundamental step towards context-awareness in machines, and thus an enabling technology for applications across multiple domains including robotics, human-computer interaction, surveillance and bioacoustics. In the realm of music, endowing computers with listening and analytical skills can aid the organization and study of large music collections, the creation of music recommendation services and personalized radio streams, the automation of tasks in the recording studio or the development of interactive music systems for performance and composition.

In this chapter, we survey common techniques for the automatic recognition of timbral, rhythmic and tonal information from recorded music, and for characterizing the similarities that exist between musical pieces. We explore the assumptions behind these methods and their inherent limitations, and conclude by discussing how current trends in machine learning and signal processing research can shape future developments in the field of machine listening.

7.1.1 Standard Approach

Most machine listening approaches follow a standard two-tier architecture for the analysis of audio signals. The first stage is devoted to extracting distinctive attributes, or features, of the audio signal to highlight the music information of importance to the analysis. The second stage utilizes these features either to categorize signals into one of a predefined set of classes, or to measure their (dis)similarity to others.

In the literature, the first stage typically utilizes a mix of signal processing techniques with the heuristics necessary to extract domain-specific information.
Chapter 8
Making Things Growl, Purr and Sing

Stephen Barrass and Tim Barrass

“All our knowledge has its origin in the senses.”

—Leonardo da Vinci

8.1 Introduction

The seminal book, Making Things Talk, provides instructions for projects that connect physical objects to the internet, such as a pet’s bed that sends text messages to a Twitter tag (Igoe 2007). Smart Things, such as LG’s recently released Wiﬁ Washing Machine, can be remotely monitored and controlled with a browser on a Smart Phone. The Air-Quality Egg http://airqualityegg.com is connected to the Internet of Things where air-quality data can be shared and aggregated across neighborhoods, countries or the world. However, as Smart Things become more pervasive there is a problem that the interface is separate from the thing itself. In his book on the Design of Everyday Things, Donald Norman introduces the concept of the Gulf of Evaluation that describes how well an artifact supports the discovery and interpretation of its internal state (Norman 1988). A Smart Kettle that tweets the temperature of the water as it boils has a wider Gulf of Evaluation than an ordinary kettle that sings as it boils, because of the extra levels of indirection required to access and read the data on a mobile device compared to hearing the sound of the whistle.

In this chapter we research and develop interactive sonic interfaces designed to close the Gulf of Evaluation in interfaces to Smart Things. The first section describes the design of sounds to provide an emotional connection with an interactive couch designed in response to the Experimenta House of Tomorrow exhibition (Hughes et al. 2003) that asked artists to consider whether “the key to better living will be delivered through new technologies in the home”. The design of the
Chapter 9
EEG-Based Brain-Computer Interface for Emotional Involvement in Games Through Music

Raffaella Folgieri, Mattia G. Bergomi and Simone Castellani

9.1 Introduction

Several studies promote the use of Brain Computer Interface (BCI) devices for gaming. By a commercial point of view, games represent a very lucrative sector, and gamers are often early adopters of new technologies, such as BCIs. Despite the many attempts to create BCI-based game interfaces, too few BCI applications for entertainment are really effective, not due to the difficulties on the computer side in signal interpretation, but rather on the users’ side in focusing on their imagination of movements to control games’ characters.

Some BCIs, such as the Emotiv Epoc (Emotive System Inc.), easily allow the myographic interface to generate game commands, but are hardly able to correctly translate the pure cerebral signals into actions or movements. Difficulties are mainly due to the fact that BCIs are currently less accurate than other game interfaces, and require several training sessions to be used. On the contrary, music entertainment applications seem to be more effective and require a short training on BCI devices.

In section two, we present a short review on implicit and explicit use of BCI in games and of main BCI commercial models. Section three focuses on our approach in enhancing gamers’ emotional experience through music: we present the results of preliminary experiments performed to evaluate our approach in detecting users’ mental states. We also present a prototype of a music entertainment tool developed to allow users to consciously create music by their brainwaves. Lastly, we shortly present the state-of-the-art of our research. In section four, we present our
10.1 The Quest

A number of years ago, a discussion between several music educators, who were also computer enthusiasts, fascinated me. The discussion was about the use of computers to enhance learning in basic musicianship, particularly pitch and rhythm matching—some of the fundamental music abilities for singers.

When a student is asked to match a tone (pitch) generated by a computer, how does the computer determine if the response is accurate? In the same way, when a student is asked to repeat a rhythmic pattern generated by a computer, how would the computer determine the accuracy of the response?

To the unsuspecting, the processes of the above events might seem quite straightforward: In the former case, the computer is programmed to generate a tone, and seeks a response from the user. When the student responds by repeating the pitch, the computer will capture the sound from an input source (typically a microphone), and then analyze it (particularly, the frequency of the tone recorded). If the numerical value of the frequency captured by the computer matches with that of the preset value of the underlying question, the answer would be correct, and thus the computer would provide a positive feedback to the student. If not, the feedback would be a negative one. In the latter case, the computer generates a series of rhythmic patterns within a defined speed (tempo) chosen by the programmer. The response from the student is again captured by a microphone, and then analyzed by the computer. If the length of each note is an exact match with the preset patterns, the answer would be correct; if not, the response is not an accurate one.

Represented logically, if \(a\) represents the numeric value of the frequency or rhythmic pattern generated by the computer, and \(b\) represents the numeric value of the frequency or rhythmic pattern captured by the computer from the response, then:

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\text{if } a = b, \text{ the answer is correct; if } a \neq b, \text{ the answer is not correct.}
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