

The Role of Apps in Electroacoustic Music: A new dimension for music through tablets and other devices

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This article describes the potential of apps as a platform for composers of electroacoustic music to present their work. It traces a history of changing concepts of structure in music from objects and symmetrical forms to dynamic systems that provide a basis for interactive instruments. Early examples of interactive instruments are presented and discussed. The opening up of music to all sounds is discussed in the context of the origins and growth of global communities within the music world. The structure of an app format for electroacoustic compositions is described and examples of various music apps are discussed from the perspective of the electroacoustic app format.

1. INTRODUCTION

Ultimately, my goal is to discuss the role that apps for iPad and iPhone are likely to play in the future of electroacoustic music.

But I'd like to begin by setting aside any immediate confusion between the medium and the message. The invention of new mediums for a wider distribution of music has often been taken by non-commercial musicians as a threat to higher levels of art, talent and understanding. It was a while ago, but I do remember hearing fear expressed by professional musicians that the mass production of pianos would lead to lower artistic standards for piano playing. When CDs came out, it was roughly the same worry, that pop music would 'dominate' the market and degrade art music. The new presence of apps in the music marketplace seems to elicit similar feelings, but since apps have a visual component, they are as much linked to games as to music. In any case, the word 'dominate' frames the question in the wrong way. There has always been a greater public for pop music than for art music, and we should all be happy that all of our publics for music, including any kind of pop and any kind of art, seem to be growing in numbers. We could ask (as a friend of mine asked): Will apps have an artistic impact? or, Will they stay at the level of games and play? And, looking at recent history, I would answer 'yes' to both questions. The pop culture, of games and play, will always be there. And, given the low prices and easy distribution of

apps, and given my observation that in this day and age pop music from the left and classical music from the right seem to be merging in the centre, apps will attract artists as well, sometimes as a distribution medium for interactive multimedia compositions that may have been developed elsewhere, but also, I am sure, as a primary creative medium.

In short, in the context of this writing, apps do offer creative and promotional opportunities to composers of artistically motivated music. But to discuss in a meaningful and useful way the role that apps may play, and to understand the creative possibilities that apps offer, my intent here is to provide a historical context for the artistic and cultural concepts in composing and experiencing music through apps.

2. COMPOSITIONS AND INSTRUMENTS

To begin with a story, I recently heard a delightful performance of Donizetti's *Don Pasquale*, first performed in 1843. From the first moment of the music, the audience was cast into the artificial world of the opera. It was a completely *charming* artificial world, even considering that I did disapprove of the closing moral to the story, which was that old men should not get married. To keep it charming, Don Pasquale, the lead character and somewhat victim of shenanigans, ultimately forgave the young lovers and all ended happily. And, re-entering the real world after the opera, we were indeed happy. But my point in bringing this up is not to applaud Donizetti nor to criticise the moral nor to praise happiness. It is to illustrate clearly that the opera, existing in its own world of time, had a beginning and an ending.

An object is an entity that is defined by the boundaries that separate it from the rest of the world. A musical composition as object has boundaries of time which are defined by its beginning and end, between which time passes in a way that is different from the passing of time in the world around it. Even a composition that is animated through performance, even if different performers might interpret the same

composition differently, even if the duration of the piece is specifically different from performance to performance, even if the performers are creative and, as in John Cage's music, make certain compositional choices, a musical composition-as-object is an artificial and temporary world with a fixed beginning and end, represented in a score, unchanged and repeatable, within which time passes in a way determined by the composer or the performer. These musical objects might be called time objects.

The nature of musical time objects changed through the first part of the twentieth century: from the 'deterministic' paradigm of the nineteenth century where each event leads to the next, where time is synchronous and where structures are symmetrical; to the structure of multiplicities at the beginning of the twentieth century, where different time bases co-exist; to the underlying complexity and unpredictability of the 1950s, in serialism, stochastics and randomness; to the portrayal of interaction in certain structures of the 1960s. And each of these paradigms has been employed by composers who have expressed them in fixed, static musical compositions as objects. Charles Ives, in 1907, in his *The Unanswered Question*, notates three simultaneously occurring yet asynchronous musical processes articulated by string quartet, woodwind quartet and solo trumpet. In the 1950s, Iannis Xenakis, by early training a civil engineer, began to use statistical methods to calculate the occurrence of events in his music; but his compositions are fixed, invariable objects that represent the paradigm, not embody it. Composed in 1964, Elliott Carter's Second String Quartet, based on interactions between different 'personages', represents the concept of interactive system; but it is as if Carter had played the interactions through in his mind and given us its best scenario in the form of a fixed, invariable object.

In short, ideas of musical structure evolved through the first half of the twentieth century from a closed beginning-and-end symmetrical form towards the idea of a dynamic system, albeit expressed as a musical object. The new ideas in the air by the middle of the twentieth century – as expressed in science, art and every other field – included underlying complexity and system theory.

The major paradigm shift from object to actual dynamic system began to take place in music in the 1970s, although there were a few earlier pioneers. A musical instrument as dynamic system, different from an object, is an instrument that functions according to an ongoing and indeterminate process in generating sound. It is not an object, because its boundaries are unclear. Its time passes without the borders of beginning or end. A dynamic system is often called a generative system, for which examples might include David Tudor's *Rainforest* (first composed in 1958) and Alvin Lucier's *Music On a Long Thin Wire* (1977),

both of which generate an ongoing sound, or orchestra of sounds, driven by their internal processes.

The general category of instrument as dynamic system also includes interactive instruments, the word interaction in this instance meaning a mutually influential exchange of information. Performing an interactive instrument can be compared to conducting an improvising orchestra. The instrument/orchestra responds to the performer/conductor and the performer/conductor responds to the instrument/orchestra. To my knowledge, the earliest examples of interactive instruments came from my work with the CEMS (Coordinated Electronic Music Studio) System, a huge analogue-programmable modular synthesiser built for me by Robert Moog in 1969 with a grant from the Research Foundation of the State University of New York, and Salvatore Martirano's work with *The SalMar Construction*, a digital instrument built by several engineers at the University of Illinois in 1972.

The CEMS System was in effect a huge kit containing a variety of modules that were connected in various different ways to form different specific instruments. *The SalMar Construction* was one specific instrument. In both cases, the instrument was designed to produce a specific composition. The composition was the instrument and the instrument was the composition. Jumping ahead for a moment to make an observation, this is also true with apps. I often quote Yeats to make a poetic point about dynamic systems: 'How can we know the dancer from the dance?'

There were (and still are) two defining characteristics of an interactive instrument: the sound engine and the performance interface. In *The SalMar Construction*, the sound engine was based on digital logic and analogue generators, and the performance interface was an ingenious plasterboard surface with thumbtacks as switches that could be touched individually or scanned in rows. In *Ideas of Movement in Bolton Landing*, the sound engine was based on analogue generators, filters and sequencers, and the performance interface was a pair of joysticks which together produced four control streams. As a historic detail, I did not know Martirano as we were separately developing these instruments, yet both compositions, both parallel examples of interactive instruments, were finished at about the same time, in 1971/72.

In 1978, having purchased a few months earlier the very first example of a Synclavier, which consisted of a computer and a digital synthesiser with sixteen oscillators wired in frequency-modulation pairs producing eight voices, I composed *Solo*. The importance of *Solo* is its clarity as an early example of an interactive instrument. My guides in creating the sound engine were a solo clarinet improvisation by J. D. Parran that I had heard in New York and my interest in Jackson Pollock's paintings in which lines varied in width and density throughout their paths. I created a software

melody that zipped up and down and around, as in Parran's improvisation, in which random numbers dictated the direction of a phrase, the number of notes in the phrase, and the intervals from note to note. The melody was a central line that created a musical place from which the eight voices, with timbres suggesting flutes, clarinets and vibes, randomly deviated, forming a texture that varied in width and density. The performance interface was two single-antenna theremins, built for me by Robert Moog, with their melodic outputs transformed into controls. With my right hand I controlled tempo. With my left hand I controlled orchestration. In a performance, I waved my arms to determine how fast things happened and which instruments were playing. But I could not control the notes, so every gesture contained a surprise that led me to the next gesture which contained a surprise, and so on. I reacted to each surprise. My decisions as to what to do next were linked to musical goals, as my decisions as to what to say next in a conversation are usually linked to conversational goals. As against waving my arms in the air and simply letting things happen, interaction, as in a conversation or as in steering a boat on windy seas, requires control and a goal.

3. INSTRUMENTS AND COMMUNITY

In the context of electroacoustic music history, the first half of the twentieth century was about electronic models of conventional instruments playing more-or-less normal music with reasonable sounds in places that violins, organs and pianos were usually played. Remembering that Clara Rockmore began her career as a violinist, the theremin can be seen as a very unusual offshoot from a violin. In fact, the most radical business plan for an electronic instrument was Thaddeus Cahill's plan, conceived at the turn of the twentieth century, of broadcasting Telharmonium music into homes and restaurants; an idea that found fulfilment more than fifty years later.

Although John Cage had foreseen it as early as 1937, the major breakthrough for electronic music happened mid-century with Pierre Schaeffer's *Étude aux chemins de fer* (1948), containing railroad sounds, and John Cage's *Williams Mix* (1952), containing sounds from everywhere. Both compositions were fixed media. These compositions were musical objects, unfolding in their own times. Schaeffer's composition was a musical object built on musical objects, as Schaeffer called them, *objets musicaux*. Cage's composition was an experiment in using random numbers to determine the order and duration of sounds. But both composers made the point very clearly that music had opened up to all sounds.

Because traditional instruments such as trombones, flutes and cellos, could not play railroad sounds or sounds from everywhere, new instruments were

invented and designed through the 1960s that could indeed produce wide ranges of sounds. There were many performances with makeshift devices. And the development of analogue synthesisers and computer programs began.

Companies making synthesisers abounded throughout the world in a kind of technological anarchy during the 1970s. The situation, especially seen from a business perspective, called for order. In 1981, Ikutaro Kakehashi, who founded Roland in Japan, and Dave Smith, president of Sequential Circuits in the United States, responded to the call by leading in the creation and proliferation of MIDI as a global standard for electronic musical devices. The standard was a uniform code for linking instruments from different companies. It was an international electronic musical language.

MIDI was the first example of a coherent global market in the field of musical instruments. Prior to MIDI, many companies had independently sold their products throughout the world, but MIDI was an international store through which any company, large or small or established or startup, so long as it conformed to the standard, could sell its instruments. MIDI opened up a wide range of electronic instruments to a wide range of musical skill, expense, learning curve and sound production. For the professional world, it was not intended to be a community as we might use the word today, but it had those characteristics of international contact in discussions, comparisons and a particular jargon. For the consumer world, the people of earlier generations who were not able to learn the skills to play traditional musical instruments could now participate in making music. In fact, many people at that time understood it in ideological terms, not dissimilar to Cahill's ideas for the *Teleharmonium* in 1905, pointing out that the experience of music became available to those who could not previously afford it.

For the non-commercial music world of composers and performers, however, MIDI was not a major hit. For one thing, for example, although I did at the time compose a few pieces using MIDI, the framework for MIDI commands was the keyboard and, certainly in my case but I believe also for many of my colleagues, it was not the best technology for defining musical instruments as dynamic systems or otherwise exploring new ideas in music.

For another thing, commercially achieved success has rarely if ever been the primary goal of composers who work in a classical artistic tradition, even when that tradition extends into today's new world of multimedia, technology, free improvisation and interaction. So whatever the specific artistic goals and style of non-commercial composers and sound artists may be, and no matter to what extent those goals may correspond with what's in the air at any time,

non-commercial composers are non-commercial because they develop their own ideas rather than resonate with commercial trends.

The points that I would like to make about instruments and MIDI are:

- Sound variety was the driving force in the development of electronic instruments.
- MIDI created a global marketplace for electronic musical instruments.
- MIDI embodied the concept of an international community based on a common technology.

4. COMMUNITY AND CREATIVITY

I often note that increasingly sophisticated technology provides us with increased visibility. We see more of everything. We see outward into a universe of stars. We see inward into atomic particles. We see the details of our human genetic structures. Whatever the field, as a scientist friend and I recently concluded, our current guiding paradigm is that there is more and more data from which we are trying to extract and define connections, networks and systems. Along that same line of thought, as technology allows us to see all of the people in the world, we extract networks based on projects and mutual interests. We build global communities.

Building a community through music is not necessarily commercial. Max Neuhaus formed communities based on people engaged together in creating a musical composition as dynamic system. In *Public Supply*, in New York in 1966, he invited people to telephone sounds into a radio station where he combined them into an ongoing collage for broadcast in real time. In *Radio Net*, in 1977, he enlarged the concept to a nationwide network of 290 radio stations and the national telephone system. For *Auracle*, developed largely between 2003 and 2004, he went global. In his words, written in 2005, '*Auracle* is a networked sound instrument, controlled by the voice. It is played and heard over the internet. Anyone can use it by simply launching it in their web browser at www.auracle.org and creating sounds unaccompanied or with other participants in real time. *Auracle* is still new and growing. If you want to interact with others, pick a time, create an ensemble with your own name, and invite friends to join you there' (Arts Electric 2005).

A community is one flavour of dynamic system. It invites participation and interaction. It is a way of viewing the world. In New York, for example, the new music community has grown; merged with media, dance and theater; and come together for concerts, workshops and meetings in myriad meeting places such as galleries, museums, stores, theatres, restaurants, cafés, bars, run-down buildings, new office

buildings and auditoriums, as well as concert halls. Patronage, philanthropy, grants and institutions, which traditionally reflected a certain classism, have in many cases become increasingly friendly and supportive. The rift between the commercial and non-commercial worlds is becoming less absolute. And, probably not to anyone's surprise, the music itself is often an open-ended, improvisational process, which almost always includes electronics.

5. COMPOSITIONS, INSTRUMENTS, COMMUNITY, CREATIVITY AND APPS

A music app, as we are addressing it here, is a software program, mainly at this time designed for tablets and smart phones. Music apps have exploded into existence to be sold or made available through a commercial marketplace of enormous diversity and millions of users, both of which have encouraged enthusiasm for developing apps. Most of what is available are familiar items such as imitations of acoustic instruments; audio tools such as mixers, filters, reverbs and vocoders for professionals and amateurs; and various forms of analogue synthesisers. In any marketplace, familiarity with a product, even products that do not represent a shallow commercialism, is a positive measure.

Viewing it in the context of compositions, as against conventional instruments or tools, familiarity has already appeared in music apps that represent the traditional classical literature. As a classical example, Beethoven's 9th Symphony is available in one app containing four performances – Ferenc Fricsay in 1958, Herbert von Karajan in 1962, Leonard Bernstein in 1979 and Edward Gardner in 1992 – with interesting and useful commentary and scores and the potential for moving between performances within a performance. As a clever example, the extremely civilised musician Michael Century, with Shawn Lawson, has created a *Goldberg Variations* app in which excerpts from different variations can be recombined in different orders, their keys sequencing smoothly, looped, tempos changed, and, in short, the listener can play with variations on the Variations. And as a familiar avant garde example, Terry Riley's *In C* is due to appear as an app within a month of this writing. My guess is that many educators are currently thinking of ways to use apps to educate a large audience in classical as well as contemporary music and that many composers are thinking of ways to present their music and compose new music for apps. It is worth repeating the obvious – that music apps reach a very large audience and encompass a large range of quality – and stating the less obvious – that apps may be used for the presentation of culturally valuable works of a high quality, including works from the history of electroacoustic music.

As a less familiar approach, several artists have used apps as a platform for multimedia in which the performance interface guides or triggers images and sound as roughly parallel activities. *Thicket*, by Joshue Ott at Interval Studios, is beautiful in its visual design and the energy of the music, both of which are guided by moving fingertips through the screen. *Scape*, by Brian Eno and Peter Chilvers, is a screen of shifting colours, patterns and object-shapes, accompanied by an ongoing flow of shifting and contemplative music, all of which can be changed by the user in creating a new 'scape'. *Bubble Harp*, first released as a work of interactive art by Scott Sona Snibbe, draws lines around your fingertips, recording and replaying your movements while creating music based on the animated forms. *Polyfauna*, an experimental collaboration between Radiohead, Nigel Godrich, Stanley Donwood and Universal Everything, is a continually changing mysterious landscape suggesting primitive life, weather, sunsets, mountains, forests, all of it flowing with automatically generated music, changing suddenly when the user touches the screen to introduce a new figure, change the scene or in some way influence the process. All of these apps are beautiful as multimedia, and they may well be introducing a new form of multimedia art, but as they currently exist, these partnerships between music and image do not point the way for electroacoustic musical instruments.

The qualifications for the new electroacoustic composition apps are that the app functions as a dynamic system in which the sound engine and performance interface maintain an interactive relationship, in which the performance interface is visually attractive and displays the dynamics of the interaction, and in which elements of sharing within a community are present as a group action or global outreach. The unique element in the app as interactive composition is the performer interface, simple enough to be used by an amateur, attractive enough to be enjoyed, and clear enough to control and display the sound engine. *Borderlands Granular*, created by Chris Carlson, provides an example of that unique element. It is consistent with the idea of a dynamic interactive system in which the performance interface is simple, attractive and clear. The user of *Borderlands Granular* places a dynamic and visually attractive pattern-of-granulation over a sound file or group of sound files, extracting and playing reordered patterns of grains. The interface is beautiful to look at and easy to understand, and the music is a pleasure to hear.

The element of sharing within a community is exemplified in *Biophilia*. Developed by Björk in collaboration with interactive artist and app developer Scott Snibbe, and Björk's longtime design collaborators M/M Paris, it is an app that subsumes other apps created by Luc Barthelet, Drew Berry, Kodama

Studios, Stephen Malinowski, Scott Snibbe Studio, John Simon Jr, Touch Press and Max Weisel. *Biophilia*, released in 2011, opens as a three-dimensional galaxy of stars and songs, and each song is accompanied by interactive art, games, music notation which can be used to sing along karaoke-style, abstract animations, lyrics, essays that explore Björk's inspirations for the track, videos of cellular activity and natural phenomena, nature shots, and other artefacts that compare musical structures to natural forms.

As an example of global reach, *Ocarina*, designed by Ge Wang in 2008, is among the earliest of the music apps (Ge 2014). It is very similar in its musical functions to its acoustic parent: synthesised sounds are activated by blowing into the iPhone microphone and different pitches are played by touching virtual buttons on the screen in different combinations. Tilting the device left-and-right controls vibrato while front-and-back controls timbre. But *Ocarina*, always connected to the Internet, can be heard anywhere in the world and mixed with other sounds. It is one example of a realisation of Max Neuhaus's *Auracle* many years later.

6. CONCLUSION

However commercial the music app marketplace may seem overall to composers of electroacoustic music, there are also examples of thoughtful presentations of musical works, multimedia artworks and other types of apps that relate to creativity in non-commercial new music. There is certainly a place in the app market for composers of electroacoustic music to present their work.

The app market, in fact, should be considered an important platform for the distribution of electroacoustic music. Following a history of music through the latter part of the twentieth century into the twenty-first century, we move from object structures to dynamic systems, media that provide accessibility to music within a large public, and a general sense of community.

Further, an electroacoustic composition as an interactive system includes a sound engine and a performance interface. It is the unique feature of an electroacoustic music app that the visual performance interface both contains controls and displays the operation of the sound engine.

As a closing observation, it would seem as if the structure of a music app, with a clear relationship between the sound engine and the performance interface, was designed specifically for electroacoustic music.

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Thanks to Jason Freeman for pointing out that although *Auracle* is still online, its functions depend upon Java applets that present security issues. The value of the site is solely historical.

The information about apps is based on the documentation that accompanies the apps and the use of the apps themselves.

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