In search of tools for the laptop orchestra

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Introduction

The laptop ensemble, or orchestra, has become a new paradigm for electroacoustic music performance in universities in North America and Europe. If an educator in EA were interested in forming such an ensemble, how would he or she go about doing so? You could simply advertise the course, and ask students to bring their laptops - the hardware problem is solved. (This is one solution offered by Huddersfield University.) Most of those laptops will probably have Ableton Live, Logic, ProTools, Pd, or MaxMSP installed. Seemingly, the software problem is then also solved. But then what? There is no easily accessible repertoire for this group, nor standardization of any sort. What tactics is this director going to pursue to make music with this group of electronic musicians?

This is the question each of us who have decided to create such an ensemble at their school, have faced, and this article is about my thoughts on the matter, and some of the strategies that have been employed by myself and others.

Live performance in the history of EA

One of the issues is that the laptop ensemble falls within the realm of live electroacoustic music. What does that even mean anymore? Five years ago, when I introduced myself as a composer who creates live electroacoustic music, that tended to place me among experimentalists who favoured improvisation and noise. This, of course, goes back to the history of live EA.

Ironically, most of the early exploration in electroacoustic music revolved around creating instruments: the Teleharmonium, Ondes Martenot, Theremin, and Trautonium are some early examples. Apart from the Ondes Martenot, most EA instruments remained on the periphery. Cage's, and later Stockhausen's, approach of bringing the studio onstage added a further sheen of experimentalism to the burgeoning field of electroacoustic music, and attracted those composers interested in exploring the periphery of an already alternative field.

Schaeffer's new paradigm

It wasn't until Pierre Schaeffer's new paradigm of composing with sound (and Stockhausen's masterwork *Gesang*) that electroacoustic music, in and of itself, could be considered a viable avenue of compositional focus. Almost immediately, the tools became standardized: a microphone, a mixer, a few tape recorders, perhaps some oscillators and noise generators, a few equalizers and filters.

I would argue that once these elements became fixed, the music lost much of its experimental qualities, and it became more attractive to those composers comfortable with modernist ideals of the fixed time object. Go to (almost) any conference or concert of electroacoustic music, and you will find young composers creating exquisite acousmatic works, who are quite possibly capable of writing high modernist pieces for orchestra and chamber ensembles as well. However, a concert of live electroacoustic music will tend to be populated with free jazz and noise improvisors, continuing Cage's (and Tudor's) experimental approach.

Experimentalism

For years, I taught a second year electroacoustic music class at Simon Fraser University, focusing upon live performance and interaction; I had to rely on the fact that my students had more likely come from alternative and experimental rock bands, than playing in orchestras. I could convince them that the real-

time interaction with technology was no more a stretch for them than the type of interaction they experienced playing in their bands. However, if ever I had a violinist or pianist in the group, they tended to be flummoxed with the notions presented in class. Ironically, these students would be some of the most experienced at live performance, which therefore raised the question: Why was (or is) live EA considered so experimental, when music schools that teach acoustic *performance* are considered conservative?

Creation vs. performance

One answer to this question is the historical separation in specialty within acoustic music of creation from performance, which hasn't occurred in electroacoustic music. By this, I mean that not only are there few standardized EA instruments, there are even fewer dedicated performers for these instruments.

Of course, we can point to Clara Rockmore and the Theremin. More recently, in the 1970s and 80s, the keyboard synthesizer became a standardized performance instrument, and we had many exceptional performers, more so in the popular music field, including Keith Emerson, Rick Wakeman, Jan Hammer, Chick Corea, Joe Zawinul, Herbie Hancock.

At this time, MIDI controllers such as Yamaha's EWI allowed Vancouver's Peter Hannan, already a recorder virtuoso, to become a virtuoso on this new instrument; but, like the keyboard synthesizer, it was an adaptation of an existing acoustic instrument. Today, we have brave composer/performers such as D. Andrew Stewart taking up the cause of the T-stick. But Dr. Stewart faces the same uphill battle that other instrument designers have faced in attempting to convince composers to write for their instrument. Composers tend to be pragmatic, and will ask themselves whether they should write their next piece for violin, which might be performed hundreds of times by hundreds of violinists, or do they write for an instrument on which less than half a dozen people can perform?

This is exactly the problem that the laptop ensemble faces: its lack of standardization has limited its ability to generate not only a repertoire, but even the tools that can lead to standardization.

Teaching live EA in the classroom

As I mentioned, I've been teaching live EA in the classroom, for over 15 years now. In these courses, I use the model that I learned from my teacher, Martin Bartlett: the final project has to involve a performative aspect. Over the years, this has resulted in live Buchla patching, keyboard synth improvisations, and lots of works for electric guitar and live processing. Our final performances, while wonderfully experimental, have tended to lack musicality, since *musicality* is, unfortunately, the last aspect to be considered in pulling the live performance together, given all the technical hurdles.

In the 1990s, the tools for these projects were the pieces of hardware sitting in the studio: the synthesizer, the sampler, the delay unit, the sensors. Today, our studio is almost entirely software based. Whereas the hardware tended to be more general and open-ended in its possible application, software – at least *commercial* software – is much more specialized and focused in its aesthetic intent. As such, the software tools have to be built from scratch. In the past, this required me to teach to my second year class the basics of MaxMSP programming.

FPA 347 - Live Electroacoustic Music Performance

For the last twenty years, SFU's third year electroacoustic music course was always taught by Barry Truax, a world re-known composer of fixed media works. Naturally, he taught it as a fixed media composition course, and the students created many prize-winning acousmatic and soundscape compositions. In 2009, Barry retired, and I inherited his course; since I rarely compose fixed media pieces, I decided to focus upon performance, leveraging the student's extra year of EA experience.

In that first class, while many of the students already had a familiarity with MaxMSP, some had absolutely no experience with programming. Rather than teach the basics of programming and waste class time, I made adjustments with my assignments, deciding that the goal would never be to merely create software, but instead to create live EA (using whatever means possible).

The first assignment involved creating a five minute work for the ensemble, given an existing tool – *Net4tet*, essentially a sample player and signal processing instrument, which I describe later. For the in-class presentation, we had the expected variety of approaches, from scored interactions, to wide open improvisations. The original goal was to just get them thinking about what it meant to create a live EA work, rather than a fixed media work. However, as the students continued to rehearse the pieces for two weeks on their own, they got better at *performing*, and enjoyed switching between composer and performer. Not surprisingly, the musicality of the music improved through rehearsals. I then realized that this was an opportunity to further explore *performance*, not just *creation*, of live EA.

Performance!

While this may have been a personal revelation, it was hardly novel, as ensembles of live EA performers in the form of laptop ensembles are cropping up all over North America and Europe. What had happened in the last 5 years that has allowed these ensembles to flourish, without the perception of experimentalism formerly associated with live EA?

Some of the reasons are technical: there has been a gradual standardization of hardware – all my students had MacBooks – that are both affordable and powerful. Some of the reasons are practical: many of these ensembles are created in universities/conservatories in which *performance* is an essential part of the program. Thus, there are experienced performers (as opposed to composers who perform) available, some of which have had little interest in *creating* electroacoustic music, but are now drawn to *performing* it. As such, this new trend could be seen as a contemporary version of the traditional separation of composer and performer. Of note is the fact that the laptop ensemble is not necessarily experimental: performers can be given quite traditional material to play, allowing the inculcated acoustic performer to feel comfortable within this scenario. As such, the greatest appeal of the laptop ensemble paradigm is that it can use performers with little EA training and *no programming knowledge.*

Historical Live EA ensembles

We have seen – especially in Canada – various ensembles of live EA performance over the years; however these ensembles have tended to be comprised of composer/performers:

- Canadian Electronic Ensemble - 1970s Toronto, billing itself as the oldest active live electronic music group in the world;

- Metamusic - Montreal 1970s, which used guitar, shortwave radio, contact mics and analogue synths;

- The Hub - San Francisco 1980s, used a computer network approach to improvisation;

- Hextremities - Vancouver 1981-85, Martin Gotfrit's (formerly Metamusic) live performance group;

- Critical Band & New Rhythm Project - Vancouver 1987-90, my own work with interactive computer systems in an improvisational ensemble.

While these groups used technology within an ensemble setting, the new model of the laptop ensemble, or orchestra, really began with Princeton's PLOrk – the Princeton Laptop Orchestra, led by Perry Cook and Ge Wang in 2005. Wang subsequently moved to Stanford, and started SLOrk, the Stanford Laptop Orchestra. Both of these ensembles treat the laptops as instruments to be performed by ensemble members, thus creating new *performance* ensembles.

PLOrk

The Spring 2008 Computer Music Journal included two papers by the directors of PLOrk which describe the ensemble, and the different compositional processes employed by its composers [Smallwood et al.] and the working methods used by the directors of the orchestra [Wang et al.]. PLOrk employs a distinctive model which involves a standardized hardware and software setup for each of the 15 performers that includes:

- MacBook Pro;

- Firewire interface;

- 6 channel amplifier;

- Teabox sensor interface;

- Hemisphere 6 speaker array;

- various "off-the-shelf" controllers, such as keyboards, percussion pads, knob/slider controllers, as well as custom-built sensors (accelerometers, pressure pads, proximity sensors, light sensors);

- software that includes MaxMSP, SuperCollider, ChucK.

While enviable, such a setup for every performer is obviously not affordable by all institutions.

The papers further explain how different compositions explore different possibilities within the ensemble – i.e. spatialization, networking, game pieces, ensemble synthesis, etc. – and offer a fascinating exploration of the potential of this ensemble. The different approaches also point out that there is little standardization over how to write for the group: in fact, each piece required its own software. Of the 35 compositions listed in the appendix, 17 are by the directors, 6 by invited guests, 12 by students. Comparing the personal lists of the group to the listing of composers, it shows that almost half the participants (the directors are also listed as performers) are performers only, offering no compositions of their own.

Affordable models

What about institutions that can't afford such setups for students? At SFU, the SFU.LaptopEnsemble began by working in our computer lab, in an effort to provide a stable, uniform platform for everyone, but subsequently moved to a combination of student laptops and lab desktops.

I consider the term "laptop" within the ensemble's name somewhat figurative, as we've used desktop computers for performances. I do not consider the portability of the laptop essential to live performance: while the instrumental qualities offered by the portable laptop does offer new performance opportunities – the physical movement of sound in the performance space, for example – the portability of wireless controllers connected to desktops can compensate for this lack of portability.

We have assumed a practical aesthetic: most of the students have recent MacBooks, and those that don't have been able to use the computers within our lab and studio. We have ended up with a Mac-centric approach for purely practical reasons: as I am providing the software tools, I tend to alter and adapt those tools daily, based upon student needs and requests. It is simply too onerous to provide stand-alone applications for multiple operating systems.

Huddersfield Experimental Laptop Orchestra (HELO)

Other institutions have used a more flexible approach. The Huddersfield Experimental Laptop Orchestra (HELO) rejects PLOrk's "global meta-instrument design", as well as Virginia Tech Linux Orchestra's "operating system uniformity" (as well as, no doubt, the SFU.LaptopEnsemble's singular use of MaxMSP). Instead, they embrace the lack of uniformity as a strength, employing a Do-It-Yourself laptop instrument design (although no hardware hacking is done). They have "resisted developing technical tools...seeking rather to promote individual approaches and solutions tailored by each performer". Furthermore, "players are solely responsible for their own setup and have a duty to ensure their ability to perform". Some "interventionist" approaches have been used, in which composer's created software for other performers, but this approach "is not encouraged within the ensemble" [Hewitt et al].

Clearly, HELO offers a very inclusive and inexpensive (for the institution) environment, but assumes technical sophistication on the part of each performer. This would be reflected in the compositions for the group, which require a detailed knowledge of what each performer is capable of, or, a much more general approach. An example composition by Scott Hewitt is "Human Shredders", an instruction-based

improvisation piece that could easily be transferred to an acoustic group. The SFU.LaptopEnsemble has used several of HELO's online scores as ensemble pieces for rehearsal purposes, and 'warming up'.

Available Tools

As suggested, the approach we have taken with the SFU.LaptopEnsemble is to use several general purpose tools created by myself, that can be quickly adapted and customized for student needs.

I created two main tools for use in an ensemble environment: *Net4Tet*, and *Duet*.

Net4Tet was created as a laptop instrument, capable of performing single gestures. The idea is that a quartet chooses a set of samples, and that they perform them using the trackpad as a controller. Processing can be turned on or off, and can be loosely controlled (the faster the mouse moves, the more processing is added). It deliberately limits the complexity of the gestures, and forces the users to listen to their gestures in relation to the ensemble. The ensemble can be networked, in which each performer triggers sounds on the other performer's computers, thus allowing for headphone ensembles.

Once students got the hang of the software, they tended to form roles within the ensemble: for example, one person creating rhythmic gestures, another high-frequency drones, another foreground gestures. Students do sometimes feel limited in only being able to trigger a single gesture, which I find curious, since I don't assume wind players feel the same limitation. What *Net4tet* does force the student to discover and develop is a musical relationship to other members of the ensemble based upon listening, rather than simply triggering events.

Net4Tet is described in detail elsewhere [Eigenfeldt 2009].

Duet was created with the notion of as a duet between an audio performer and a software performer. Similar to *Net4tet,* the software allows for the playback and manipulation of pre-recorded files, but also the real-time recording of audio. Since it was conceived as a single-user system, the software is capable of generating several gestures at once, as well as interacting directly with incoming audio.

Interestingly, this software proved to be the most popular with the students for their pieces, since it allowed for a greater complexity of individual gestures.

Both are available as applications (OSX) and source code (Max 5) on my website, http://www.sfu.ca/~eigenfel/software.html

Conclusion

Anyone that has created a laptop ensemble has no doubt faced the problems outlined in this article – what is interesting to me are the solutions that others have found. To my knowledge, their is no organization, conference, symposium, or online repository of information dedicated to the laptop orchestra/ensemble phenomenon. Some resources have appeared, listed in the following section. Hopefully, those of us interested in continuing to work in the field will find a way of sharing our personal solutions, and beginning a general dialog.

Useful Links

So, you want to start a laptop orchestra

http://wiki.cs.princeton.edu/index.php/So,_you_want_to_start_a_laptop_orchestra%3F

A wiki created by PLOrk outlining some of their strategies, including links to the PLOrk repertoire.

The International Association of Laptop Orchestras

http://www.ialo.org/doku.php

A small wiki dedicated to laptop orchestras, with some historical detail and links to ensembles.

HELO : The Huddersfield Experimental Laptop Orchestra

http://helo.ablelemon.co.uk/doku.php/start

Repertoire, code, and papers on their approach to the laptop ensemble

Princeton Laptop Orchestra

http://plork.cs.princeton.edu/

News and information about PLOrk.

Stanford Laptop Orchestra

http://slork.stanford.edu/

Articles and media on SLOrk.

References

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Hewitt, S., Tremblay, P.A., Freeman, S., Booth, G. 2010. "HELO: The Laptop Ensemble As An Incubator For Individual Laptop Performance Practices", Proceedings of the ICMC 2010, ICMA, San Francisco.

Smallwood, S., Trueman, D., Cook, P., Wang, G. 2008 "Composing for Laptop Orchestra", Computer Music Journal, 32(1):9-25, MIT Press Cambridge, MA.

Wang, G., Trueman, D., Smallwood, S., Cook, P. 2008 "The Laptop Orchestra as Classroom" Computer Music Journal, 32(1): 26-37, MIT Press Cambridge, MA.

Biography

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http://www.sfu.ca/~eigenfel