

Calder's Violin: real-time notation and performance through musically expressive algorithms

International Computer Music Conference
 September, September 2012
 Bielefeld, Germany
 Digital Performance Laboratory, Audio Research
 University

Context
 A 7000 hours project in an
 interdisciplinary research in
 digital performance

Why?
 algorithmic and digital, interdisciplinary
 (music and performance arts)
 the challenge for technology and algorithmic
 writing systems: expressive control and
 real-time interaction, modeling and control
 and the new (writing) musical space
 the impact of technology in music and performance
 and performance
 exploring digital performance processes through
 algorithmic
 in a computational and in real-time algorithmic
 and digital performance systems in relation
 and an algorithmic

The technology:
 digital performance
 digital performance
 digital performance
 digital performance

The MIDI:
 digital performance
 digital performance
 digital performance

Algorithmic notation:
 digital performance
 digital performance
 digital performance

Real-time notation:
 digital performance
 digital performance
 digital performance

Music:
 digital performance
 digital performance
 digital performance



Performance:
 digital performance
 digital performance
 digital performance

Performance Comments:
 digital performance
 digital performance
 digital performance

Performance:
 digital performance
 digital performance
 digital performance





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International Computer Music Conference
Ljubljana, September 2012
Richard Hoadley
Digital Performance Laboratory, Anglia Ruskin
University

Contact

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this presentation is available at:
<http://rheadley.net/presentations>

Why?

unifying dots and signals: enlivening electronic music with live performance [quote]

links between 'technologies' and approaches:
mapping between domains: physical gesture
into live notation: understanding which physical
gestures have 'meaning' and which don't

my interest in liveness in music performance
and improvisation

learning about compositional processes through
automation

as a consequence and to clarify, it's a technique
and a tool, just as Calder's Violin is both piece
and an experiment

Dots and signals

"Music processing", in the way that this community uses it, denotes the processing of music information, which is stored in its structured symbolic musical 'Gestalt'. The term 'music processing' implies a difference from the signal processing community, in that it does not deal with sound as the source material for investigation, but deals with **music as score or music as timebased structure stored in a symbolic form, such as codes, languages, etc.** Obviously the boundary between signal and 'music processing' can become very blurred, but it is useful to mention this division as it seems that the research, its communities and their methodologies tend to be different and do not overlap in a major way. This makes the existing polarity socially more understandable even if not content wise. Unlike the music processing community, the signal processing side of music technology has always had a large following, consequently the literature is overflowing in abundance of work in this area, with spills into the more unacademic popular reading lists

Carola Boehm, Book Review, Organised Sound 7(1): 79-82, 2002

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The technique...

...investigates and implements...

algorithmic composition

music composition, performance, improvisation and notation

physical computing and interactivity

The tool(s)

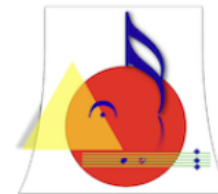
generate music and/or common practice notation (plus) according to certain rules

facilitate communication between SuperCollider and INScore

<http://supercollider.sourceforge.net/>



<http://inscore.sourceforge.net/>



Related work: algorithms

Aaron et al., "A principled approach to developing new languages for live coding", Proceedings of NIME 2011

Collins, N. "The Analysis of Generative Music Programs." Organised Sound 13(3). 2008

Hedelin, F. "Formalising Form: An Alternative Approach To Algorithmic Composition." Organised Sound 13(3): 249-257, 2008.

Loy, D. G., "Musimathics : the mathematical foundations of music", Cambridge, Mass. ; London: MIT Press. 2006.

plus Cope, Roads, Xenakis, etc., etc...

Related work: live notation

[definition]

- MaxScore (Didkovsky, Hadju)
- Bach Project (Agostini, Ghisi)
- eScore (McClelland, Alcorn)
- Lilypond with extensions
- Live Notation (Eacott, Collins)

The functional emphases are different: quality, speed, variety of rendering, etc.

terminology:

'live notation' is...

music notation that is generated as the performance progresses and where this process is itself considered to be of central importance in the composition. In this case I am referring to **common practice music notation**, generally understood to be the notation that, like common law, has become commonly used over the last 800 or so years

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Examples

performances, etc.

why, really, might the notation be displayed? Other pieces don't do this, so is the fact that this is quite interesting make the piece more 'disposable', more interesting for technical rather than musical reasons



Cambridge Festival of Ideas 2011
Mifune Tsuji <http://rhoadley.net/calder>





SuperCollider Symposium 2012

Marcus Barcham-Stevens <http://rheadley.net/calder>



Demonstration

notes

phrases

alternate notations



“My personal bias would be to urge the composer to extend this work such that the ‘surface details’ of the notation and automatic piano that vary each time do so in response to some **audio analysis** of what the violinist is actually playing, bringing an element of **machine musicianship** into the mix here. I think that would create a much more **compelling reason for using real-time notation** in this work in the first place.”

machine musicianship as a compelling reason for using real-time notation

"I would imagine that it will take some time for the performer to feel comfortable with the changing/evolving materials they are asked to perform. I would personally find it a bit **disconcerting**, especially when the screen will momentarily go blank and then more notes are added to the unfolding line (it could be **hard to keep track of one's place in the score**)."

concern over possible difficulties in keeping track of one's place in the score

"I like the concept for the piece but find that it needs significant work before it can be faithful to **the compositional idea** and reliable with regard to the **performer's giving an accurate rendering of the piece.**"

"in the rehearsal video that was provided the violinist seemed to do a good job making convincing gestures, but not always at playing what was on the computer screen. The way the notes kept adding themselves to some of the modules did not help. **The performer needs** to be able to scan the entire module and **the module needs to remain fixed** on the screen once presented. Also, at the most frantic moments the modules flashed by too fast for a performer, even one who had memorized every module, to be able to perform them all correctly. As a result **the performer in the video dropped many of the modules and many more were not played correctly or completely.**"

"the violinist should receive all possible modules to rehearse. **The violin gestures are otherwise performed in approximation.** Also, this would possibly help to counteract **the impression that the violinist is constantly awaiting instruction -- rather than actively shaping the gestures in response to the context** -- which to me is a negative aspect of the piece."

concerns over the feasibility of an 'accurate' and structured rendition

A rehearsal score is needed. True to the Calder reference in the title, the work contains **pre-composed modules** that come back at different times. **The performer needs to have all of those modules available for rehearsal purposes in order to be ready to perform the modules instantly once they appear on the computer.** Also, since **the piece seems to have some intentional ordering** (Big Bang 1!, Big Bang 2!, Big Bang 3!, from the video), and **perhaps even a predetermined overall arch**, the grammar with regard to determined and random elements also needs to be explained to the performer. If the musical content of some of the modules is being generated on the fly, then that creates a more immediate performance issue difficult to overcome. **This relegates the performer in those instances to being a mere sight-reader** (or expert improviser). I have no evidence that this is indeed the case, but if it were, **I'd strongly recommend that pre-composed modules be substituted in their place.**

concern over lack of rehearsal, familiarity and even the status of the performer

Performers' comments

I put these concerns to some of the performers involved

Cheryl Frances-Hoad
composer (and occasional, splendid 'cellist)

The comment was that the necessity of performance when using the technology integrates the performer - to bring a more spontaneous and equal treatment. Another stated that the responsiveness that the music in a secondary reading instruction - rather than actively shaping the gesture in response to the context - which is not a negative aspect of the piece.

I think this is a very negative interpretation. It's true that one does have to interpret, obviously, but once you get into the piece I think it's very expressive to shape what that is from of note to what that comes generally. For example if it's just the computer in one way, but if on the previous page I had been playing on a certain register, and then this page you have the same register but it's more like you're in the same register, and higher or lower, I would choose other things or some notes, depending on whether, on the previous page I had been holding on to a note by the end of the music. So, I think one can't just get into the previous, and looked at how the page change (eg. as one page they was changing very slowly - but I actually enjoyed it as it allowed me to react to a wider range of options if that is playing in a certain way. One page you need to see a page for every that take a time to get something that the previous page you to understand a context.

Perhaps the piece demands someone who is capable of doing this - for instance a very good performer, playing exactly when the page change, beginning to play the next page etc. might not work so well. But it's not actually what that is possible to do beyond if one is a performer and a long would be the page change to something very fast, it takes a few seconds to get just that second when you can the page etc. I think to have the process of not knowing what was going to come next and how often it did occur in which really only took a few minutes of rehearsal, it's certainly a challenge to do this in front of an audience as well, needs to be kept in mind that there are other things that are responding to other music in a chamber music piece in a context, I know, but it certainly didn't feel like it.

- enjoyable to have more control and contribution
- creative use of system idiosyncrasies (rapid changes in page writes)
- incompatibility with 'standard' performance
- challenging, comparison with chamber music

Re *shaping of the structure* - whilst obviously the notes were put up in front of you, it was only the notes - no tempo/dynamics etc. so I was able to shape the piece a lot I thought. I can't remember how it worked timing wise - I don't think I really knew when the piece was going to stop - and perhaps if I had known this I would have been able to do more with the structure?

I do see the point that in much 'standard' performance one has more time to create an interpretation, to shape phrases, etc., and that to an extent this is, by definition, missing from my version of live notation.

Sure - it's true that I didn't have time to practice things, and perhaps the thing above about not having great control over the entire structure (I'm thinking of a traditional sonata where you might interpret the recapitulation of a theme in a subtly different way, which is perhaps only possible to do if you have the music in front of you to a degree. But I don't think this was impossible in the performance the other day - you could certainly remember types of melodic material, as I was quite struck by how much similar music came up on the computer screen. For instance a melody in the 'tense' range of the cello came up quite a bit - and seemed very similar, so you were able to treat this almost like a recurring theme. Having only played the piece once, I think with a few more performance you could definitely tune into this sort of thing etc.

In one sense you might almost say that *expression was foremost in my mind* [comment], after reading the music - perhaps the lack of any really traditionally formed crafted melody almost made me try and be more expressive? Probably not MORE expressive, as you always try to be as expressive as possible, but there was a sense of 'trying to do the most' with the notes that you were given (a melodic line of f g f for instance, you'd really try and bring out the arc of that gesture) which was very pleasing. Perhaps the lack of dynamics, leaving you to find the natural expressive dynamics for such gestures, almost added to the pleasure of playing it - I almost felt that I'd discovered the expressive potential of some small melodic gestures etc, and this made me feel like I was playing an active part in the creation of the piece.

Interesting take on remembering structure - that this could happen within the time-frame of the piece

the use of 'archetypes'

very positive use of negatives (the lack of 'craft' made her more expressive; the lack of dynamics enabled more natural, 'very pleasing' expression

The 'awaiting' instruction thing - I was a bit scared at first about this - but actually it becomes very enjoyable. It's again perhaps to do with performance - the challenge of making something coherent and expressive for the audience when at some times the pages are flicking by very fast etc - there's something exciting about doing that in performance - perhaps it's partly an ego thing! About being proud of yourself when you create something expressive etc - it's almost playing with the dynamics of performance - that kind of adrenaline thrill on stage. I think part of the thrill of performance is that tiny part of it which could go wrong, and you have to keep going regardless and not let the audience realise etc.

on awaiting unknown instructions: the thrill of that tiny part which could go wrong(!?)

One comment was that the immediacy of performance when using the technology 'relegates the performer ... to being a mere sight-reader (or expert improviser)'. Another stated that 'the impression [is] that the violinist is constantly awaiting instruction -- rather than actively shaping the gestures in response to the context -- which to me is a negative aspect of the piece.'

I think this is a very negative interpretation. It's true that one does have to sightread, obviously, but once you get into the piece I found it very enjoyable to shape what I had in front of me to what had come previously. I'm not sure if this is just the composer in me etc, but, if on the previous page I had been playing at a certain register, and then the next page came up with bits of music with both music in the same register, and higher or lower, I would choose either the higher or lower music, depending on whether, on the previous page, I had been building or relaxing the emotional feel of the music. So, I think, once one had got used to the process, and worked out how the pages change (e.g. at one point they were changing very rapidly - but I actually enjoyed this as it allowed me to select from a wider range of options (if one is playing a slow melodic line you only need to see a page for a very short time in order to play something from it) the process allows you to almost be a composer.

Perhaps the piece demands someone who is capable of doing this - for instance a very literal performance, stopping exactly when the pages change, beginning to play the next page etc, might not work so well. But I'm not actually sure that this is possible to do anyway. If one is mid phrase on a long melodic line and the page changes to something very fast, it takes a few seconds to get your head around what 's on the page etc.

I actually found the process of not knowing what was going to come next great fun, after I'd got used to it (which really only took a few minutes of rehearsal). It's certainly a fun challenge to do this in front of an audience as well, and to be honest it didn't feel that different from really responding to other musicians in chamber music (this is a stretch, I know, but it certainly didn't feel alien).

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[I can't drag the text out there...]

on awaiting unknown instructions: the thrill of that tiny part which could go wrong(!?)

I can't imagine what she means...

Performers' comments

Marcus Barcham-Stevens

violinist and composer

In reply to the essential question you proposed about whether I felt 'relegated' and that I was 'only' constantly waiting instruction in the performance of your piece, the answer is clearly 'No'. Although this was an extremely different (yet stimulating) experience for me as a performer, there was still quite a **large bandwidth of creativity and interpretation on my part**. It's a different bandwidth to the degree of interpretation required in a performer when playing a Brahms Sonata, for instance, but it is still a uniquely strong bandwidth, and also a **particularly exciting and 'in the moment'** one, given the degree of uncertainty (though within known parameters) of the computer's exact instructions, and the need for total focus and concentration, possibly exceeding the concentration in 'standard performance', which inevitably gives the performance added tension and excitement.

- **relegation to sight-reading: 'no'**
- **creative interpretation**
- **in the moment, adding tension and excitement**

Whilst playing the music from a screen, **if the screen suddenly changed to new music**, I had the choice as to whether to jump immediately to the new screen "mid-phase" as it were, or whether to carry on playing the rest of the first screen's music from memory, or whether to carry on playing a portion of the last screen's music from memory and then move on to the new screen at a point which I felt was musically appropriate. This was also true of the longer, more melodic phrases towards the end of the piece, in which I could look ahead and memorise most or all of the line, and then if the screen ended and there was a passage of just the computerized piano playing alone, I could choose whether to keep playing the melodic line from memory and enjoy the "clash" it created with the computer's music, or whether just to stop playing. One challenge in the faster bits of music, was what to do if there was not enough time to complete the music before the screen changed to another fast gesture. I think my instinct was to jump screens more in the fast gestural music and to linger more on the previous screen in the slower melodic music. This may also be so because it is easier to look ahead and memorise slower music than faster music.

- **role of memory in performance: longer, more melodic phrases can be memorised and then creative choices made**

There were **individual choices** I could make about playing the musical material from some screens, for instance: the **exact tempo** I played the lines in, exactly when I started a bit of music; in the succession of often high notes towards the start - whether I played them as real stepped notes or false harmonics; whether I **shaped some of the fast flourishes** as ff diminuendo pp, or pp crescendo ff gestures, and how I varied these 2 shapes; in the 'measured trem repeat phrases ad lib' fastish ostinato screens, at what point in the ostinato to make the repeat and turn the figure into an ostinato (eg after 2 notes, 3 or 4 or whatever?) and whether to play tremolo or non-tremolo (though I am not sure whether this was a choice on offer!); in the 'more complex rhythms, more freedom' section, how I developed the ostinato figures; in the 'breaking up ad libitum', how I chose to break up the music turning the neat ostinatos into a destructive musical force. With all of these choices, **I would not have had time to consciously think and reflect about the best possible interpretation option**, as one would have in practising a Brahms Sonata, so my responses acted more on an **instinctive, musically intuitive level**. In the same way an improviser plays, but they are still creatively musical decisions for the performer, though they may function more on a subconscious rather than conscious level.

I practised the piece quite a lot before with laptop, and this together with the rehearsals gave me a strong sense of the piece. I knew what the parameters were and roughly what I would be asked to do (for instance the piece would begin with high trills, then have a succession of equal notes in a line, there would be a 4 or 5 note rising figure, there would be fast, gestural flourishes, there would be a rhythmic ostinato which at one point I would have to play together with the computer, there would be 3 "big bangs", the music would break down, and then there would be some longer-breathed more lyrical lines, and then the music would disintegrate). Though the exact pitches and rhythms would be different each time, the essential individual parameters **would be the same, and the overall structure and expressive shape of the piece was always the same**. I had internalized both these parameters and the overall structure, in the same way as a performer may internalize a Brahms Sonata in the rehearsal process, so when it came to the performance, I could draw on this internalization of the music, mould it accordingly, yet couple it with the freshness of playing new notes generated in real time. The combination of these two things for a performer creates something original and exciting in performance. I had absorbed the "essence" of the music so I could shape them in performance, though with the freshness of someone playing new pitches for the first time.

Marcus did have a video of a couple of 'versions' of the piece and so is able to say that he 'practised the piece quite a lot'

He makes the point that he understood the 'gestalt' of the music which did enable him, in his opinion, to 'shape' the music.

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There were individual **choices** I could make about playing the musical material from some screens, for instance: the **exact tempo** I played the lines in, exactly when I started a bit of music; in the succession of often high notes towards the start - whether I played them as real stopped notes or false harmonics; whether I **shaped some of the fast flurries** as ff diminuendo pp, or pp crescendo ff gestures, and how I varied these 2 shapes; in the "measured trem repeat phrases ad lib" fastish ostinato screens, at what point in the ostinato to make the repeat and turn the figure into an ostinato (eg after 2 notes, 3 or 4 or whatever?) and whether to play tremolo or non-tremolo (though I am not sure whether this was a choice on offer!); in the "more complex rhythms, more freedom" section, how I developed the ostinato figures; in the "breaking up..ad libitum", how I chose to break up the music turning the neat ostinatos into a destructive musical force. With all of these choices, **I would not have had time to consciously think and reflect about the best possible interpretation option**, as one would have in practising a Brahms Sonata, so my responses acted more on an **instinctive, musically intuitive level in the same way an improviser plays**, but they are still creatively musical decisions for the performer, though they may function more on a subconscious rather than conscious level.

I practised the piece quite a lot before with laptop, and this together with the rehearsals gave me a strong sense of the piece. I knew what the parameters were and roughly what I would be asked to do (for instance the piece would begin with high trills, then have a succession of equal notes in a line, there would be a 4 or 5 note rising figure, there would be fast, gestural flourishes, there would be a rhythmic ostinato which at one point I would have to play together with the computer, there would be 3 "Big Bangs", the music would break down, and then there would be some longer-breathed more lyrical lines, and then the music would dissipate). Though the exact pitches and rhythms would be different each time, the essential individual parameters would be the same, and the overall structure and expressive shape of the piece was always the same. I had internalized both these parameters and the overall structure, in the same way as a performer may internalize a Brahms Sonata in the rehearsal process, so when it came to the performance, I could draw on this internalization of the music, mould it accordingly, yet couple it with the freshness of playing new notes generated in real time. The combination of these two things for a performer creates something original and exciting in performance. I had absorbed the "Gestalten" of the music so I could shape them in performance, though with the freshness of someone playing new pitches for the first time.

Marcus did have a video of a couple of 'versions' of the piece and so is able to say that he 'practised the piece quite a lot'

He makes the point that he understood the 'gestalten' of the music which did enable him, in his opinion, to 'shape' the music

Next steps

multiple parts all generated live: 'group' structured improvisation

investigating the balance between composition, performance and improvisation

machine listening

dynamics, phrasing, annotation...

live coding of 'real' performance

'The Fluxus Tree' (composition) and 'Hands' (gismo) show, amongst other things, the importance of some gestures, and yet the fact that they shouldn't all be taken into account

it's clear that physical mappings are not understood: experimenting in 'The Fluxus Tree' has revealed many different methods and possibilities

pedagogical uses, maybe particularly support for sight-reading and improvisation

The Fluxus Tree

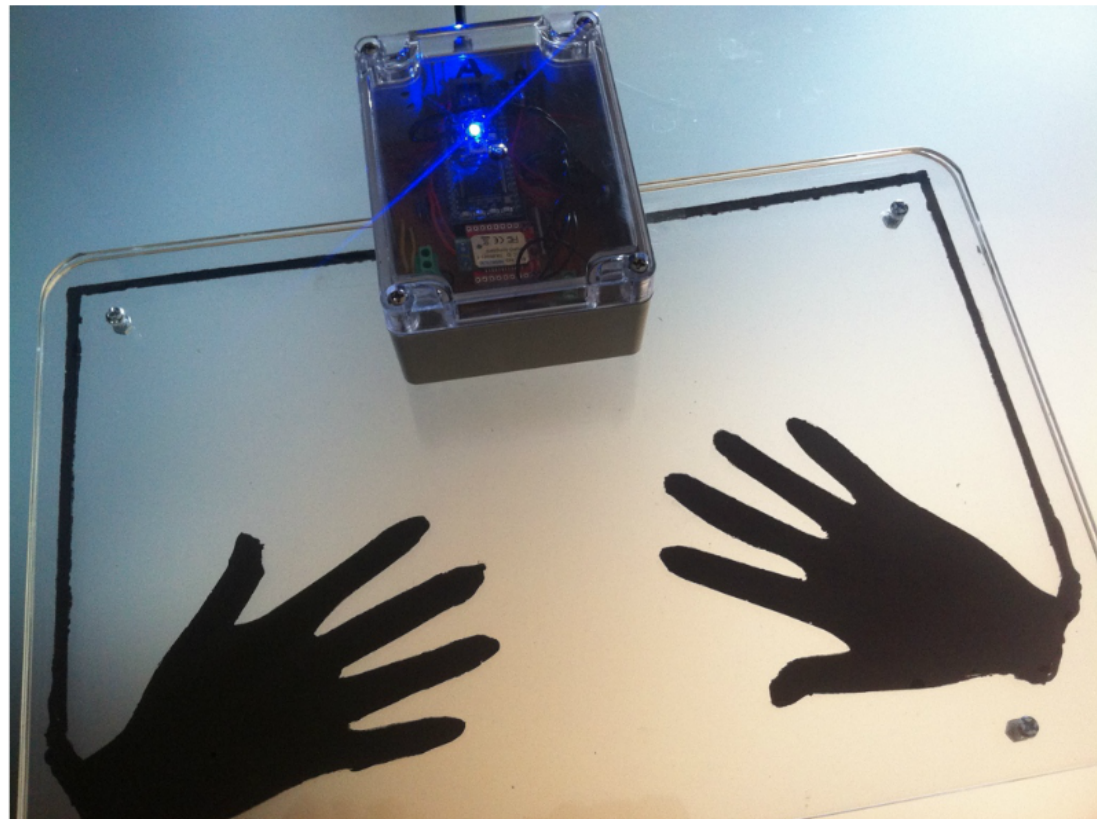
physicality, sculpture, mapping, gesture, movement...



Touching Sound and Gismos...

Generic Interfaces for Socio-musical Orientation

Computer Supported Cooperative Work



Thankyou

any questions?

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this presentation is available at

<http://rheadley.net/presentations>

The 'awaiting' instruction thing - I was a bit scared at first about this - but actually it becomes very enjoyable. It's again perhaps to do with performance - the challenge of making something coherent and expressive for the audience when at some times the pages are flicking by very fast etc - there's something exciting about doing that in performance - perhaps it's partly an ego thing! About being proud of yourself when you create something expressive etc - it's almost **playing with the dynamics of performance** - that kind of adrenaline thrill on stage. I think part of the thrill of performance is **that tiny part of it which could go wrong**, and you have to keep going regardless and not let the audience realise etc.

[I can't drag the text out there...]

on awaiting unknown instructions: the thrill of that tiny part which could go wrong(!?)