New creative possibilities through improvisational use of compositional techniques

- a new computer instrument for the performing musician

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Contents and pages:

Introduction

The starting point for this scholarship project is a desire to work further with themes in the intersection between composition and improvisation. The focus is on the aspects of performance.

The scholarship work consists of three main elements:

1. To explore the artistic potential that is to be found in the intersection between real time composition and improvisation.

2. To develop a new instrument that facilitates improvisational use of composition techniques.

3. The work is to end up in the performance of works of music that make use of the tool in interplay with various other performers.

In the work of exploring the boundaries between composition and improvisation, I want to use various composition techniques in improvisation. The main emphasis will be on techniques from the 20th century, and I want to make use of these in order to define rules for real time composition, and through this make the basis for a computer based instrument for use in improvisation.

A number of composition techniques are currently difficult to employ in an improvised setting. The reason is that they, to a considerable extent, build on intellectual constructions that are hard to incorporate in direct playing on traditional instruments. As an example, I may mention serial techniques. In a computer based instrument, such techniques will be more adapted for use both intuitively as well as improvisational. One has a greater measure of freedom to automate the constructed elements to a certain extent.

The use of live sampling is an important technique in order to generate and select material. This has been an important method for me to use during the work because it makes the basis for a spontaneous approach. It is also reflected in an additional dimension of experience of the music, for the performer, the composer and the audience alike.

Themes and issues:

Background and history

Algorithms as a method of composition are the starting point for many works, especially during the last hundred years. We also find examples of algorithmic composition throughout history. The fascination with mathematical relations in music goes back to Pythagoras' "music of the spheres", and automatic procedures of composition may be found all the way back to the 18th century with the "Musikalisches Würfelspiel" of the day.
Various composers have made use of algorithms to a various extent. Both Schöenberg's serial thinking and Cage's aleatorics may both be designated as approaching algorithmic

composition. More recently, composers such as Eduardo Miranda, Michael Gogins, David Cope are prominent representatives of this method. There are several views as to whether one ought to tune one's algorithms until one is satisfied with the work that the algorithm creates, or whether one should intervene to modify the algorithmically generated material afterwards in order to obtain the required result. A synthesis of these two extremes is found in the performance of the algorithms in real time and thus the work may be adjusted and adapted while the music is being played. This approach makes the basis for the concept of "real time composition". In my view, this makes for a more immediate expression that may be experienced as warmer. The humane situational reactions to what you hear contribute the contribute significantly to the musical result.

Artistic intentions and objectives

The intention of the scholarship work is to create music with new approaches to the fields of composition, improvisation and ensemble playing and with the use of an extended tonal palette.

The prerequisite for the artistic objective is to map the opportunities for establishing new tools for use in real time composition, as well as to implement these in computer programs in order to obtain a great extent of flexibility in an improvised musical setting. I seek the composition's arranged structure and form, but in an improvisational expression. A main element in the performance is the use and manipulation of sound material recorded during the same performance (live sampling).
In this context, the use of live sampling is conceptually important because it makes the basis for immediate re-use of improvised elements within a structured framework.

In order to be able to do that, it is necessary to develop a new musical instrument that is suited for this type of performance. The instrument will be computer based, with an external control panel on which the performer may govern the parameters for the performance.

As a performing musician and composer, I constantly seek towards the immediate expression in the music as a language. A language that one masters perfectly. It is important to establish a space for the exchange of views between the elements in the language – a dialogue. A fruitful dialogue seems more to the point when the exchange of views is happening in real time, as opposed to a situation in which the work is carried out "offline".

Methods and tools

Composition technical issues

In the scholarship project, I will focus on various composition techniques. In part, I want to make use of the well known composition techniques (for example serial, stochastic, pitch class, interval vector techniques). It may also be appropriate to borrow processing techniques from other fields of expertise in which techniques for data manipulation are employed and that may be suited for musical composition. Examples of such techniques are L-systems, Markov chains, re-combination techniques and Cellular automata.
Here, one ought to find techniques that implicitly embody a musical syntax, because this will alleviate the work of exploiting the selected techniques. In this context, musical

syntax is defined as some sort of internal logic in the material that is the result of a predetermined process or technique, and that this internal logic may equal a musical grammatical construction of a statement.

Etudes

Most probably, it will be suitable for the purpose to compose individual etudes, smaller musical pieces in which each individual technique may be explored in isolation.
This work may be carried out as composition work in a traditional sense of the word, with pencil and paper. Alternatively, the etudes may also be accomplished by implementation in a simple computer program. Experiences that have been made during studio productions, with editing of composed and improvised progressions may, to a certain extent, replace the work with etudes. Likewise, work with concrete productions in which the focus is on individual issues may function as etudes in this context. In these productions, the work may be of an artistic or a purely technical nature.

In part, this work will consist of exploring techniques for variation and theme processing. Another important element is, however, to construct progressions with reference to form, both on the local as well on the global level of the music. The techniques are to be incorporated as components in the instrument to be constructed during the project period.

Audio processing

It is a desire to exploit the sound source material from live sampling to the maximum. Audio processing techniques known from electro acoustic music are used as forms of variation for the sound material, in addition to the structural composition techniques.

Only very seldom, basically new techniques for audio processing are discovered, but in the combination of existing techniques, there are still great unexplored fields.

The preparation of a general architecture for audio processing is desirable. The advantage of this is that the architecture may be set, whereas the tonal variations are obtained by means of dynamic changes of the parameter settings. In this context, a general architecture is defined as a setting for sound synthesis and audio processing adapted to the concrete artistic requirements that the task involves. It seems natural to focus on granular sound synthesis techniques as a starting point to implement such a general architecture.

Control model, interface

The design of a control panel for the instrument is a challenge. It is desirable to arrange for a situation in which the performer may benefit from previous instrumental technique, at the same time as a great number of parameters that do not have an equal function in the traditional instruments become available. The use of techniques for translation (”mapping”) from one set of parameters to another should be considered.

Moreover, I want to mention that the development of a completely new interface for the instrument requires work of such a scope that it in itself equals a scholarship project. Therefore, the emphasis will be on finding simple and functional solutions that provide

access to the necessary parameters. Full implementation of a sensor system for physical interaction with the instrument is thus beyond the scope of this scholarship project.

Testing by means of ensemble playing, studio work and concerts

A fundamental part of the work will consist of performing activity of various types.
It will be essential to spend time on performance work with the instrument in order to be able to assess continuously both the musical processes as well as the control panel for the instrument.

Further, studio work involving recording and the subsequent editing will function as a tool both for documentation and assessment. During the editing, alternative solutions may be tested and areas that present problems will appear more clearly.

In its turn, this will form the basis for changes and enhancements of the instrument during the course of the process. To have the opportunity to work creatively and actively experiment to find alternative solutions for the instrument (and for the performative use of it) will be of vital importance for the final result.

Documentation

The documentation of the work will consist of the computer programs/instruments that are produced during the project including written documentation of functionality and the user manual. Documentation in the form of a user manual for the software is necessary in order that others may make use of the software, and thus arrange for dissemination within the international professional environments. This part of the documentation will be presented in English. The software is to be distributed free of charge on the Internet and will have a license that protects the copyright and simultaneously arranges for other users to develop the software further.
Moreover, the artistic employment of the instruments will be documented through concerts and recordings. The recordings will in part be documentation of concerts, in part studio productions. Possibly, it may be suitable for the purpose even to use the instruments for audio installations in which the composition or processing techniques in question are utilized.
It is a goal to produce at least two written articles that deal with issues related to the scholarship work. These articles will be sought published in relevant publications, as an example ”Computer Music Journal”, ”Journal of New Music Research”, or ”Organized Sound”. In addition, the existing activity is maintained in the relevant discussion forms on the Internet, for example the e-mail list for csound which is available through www.csounds.com. This website also publishes relevant articles and may be an alternative publishing medium for articles.
Certain activity will be carried out in order to make the project visible by means of specialist conferences such as ”Trondheim Matchmaking”, Ultima etc.

Research community

Currently, NTNU is in a constructive process involving great emphasis on interdisciplinary cooperation within music technology. This process has been going on for

some years. The interdisciplinary environment creates a good and solid background for my project.
The jazz department at NTNU is very well suited for practical testing of my results in improvising ensemble playing with other musicians.

Another important aspect for me is the continuation of the various musical collaboration projects that has already been established. This will be an important counterweight to doing ensemble playing in continuously changing constellations and situations.

Relevant research communities outside of NTNU

Research communities for real time composition and sensor technology are geographically spread and it is important for me to keep in touch with the specialist communities in other places in the world. It will be natural to visit some of the following institutions: IRCAM, CNMAT, University of California, Columbia University, MIT, Berklee College of Music, Teknische Universität in Berlin, and more.
During the course of many years, I have established an international specialist network that will make exchange and collaboration feasible.

Relevant literature for the project work

A selection:

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Hunt, A.& M.Wanderley & M.Paradis. (2003) "The importance of mapping in Electronic instrument design." Journal of New Music Research 2003, Vol32, no 4
Lartillot, O. (2004) "A Musical Pattern Discovery System Founded on a Modeling of Listening Strategies" Computer Music Journal, 28:3, pp. 53–67
Lerdahl, F. (2001) "Tonal Pitch Space." Oxford University Press
Lindenmayer, A. & P. Prusinkiewicz (1990) "The Algorithmic Beauty of Plants." Springer Verlag
McCartney, J. (2002) " Rethinking the Computer Music Language: SuperCollider" Computer Music Journal, 26:4, pp. 61–68
Miranda, E.R. (2001) "Composing Music with Computers." Focal Press
Momeni, M. & D. Wessel (2003) "Characterizing and Controlling Musical Material Intuitively with Geometric Models." Proceedings of the 2003 Conference on New Interfaces for Musical Expression), Montreal, Canada
Negus, C. (2002) "Red Hat Linux Bible." Wiley Publishing
Roads, C. (2001) "Microsound." MIT Press
Rowe. R (2004) "Machine Musicianship." MIT Press
Strogatz, S. (2003) "Sync: : The Emerging Science of Spontaneous Order" Hyperion Books

Time schedule

1 Consolidation (October 2004 – February 2005)

- Delimitation of the project's final frames and methods, final project description
- Appointment of vice teaching supervisor
- Academic orienteering within generative algorithms
- Testing of methods and tools, choice of techniques for further exploration

in part 2 (proposal: Serial, Lindenmayer, Interval Vector, genetic algorithms, neural networks, frequency modulation techniques for rhythm)
- Basic work, structure plan for the computer programming.
- completion of the first work (for Trio Alpaca, initiated before commencement, but the work is of such a nature that it ought to be included in the project, also as documentation of methods and artistic level at the start of the project)

2 Exploration of part elements (February 2005 – January 2006)

This phase will consist of exploration of the part elements for further use in the development of concrete projects (phase 3)

- Studies of existing works that employ the techniques I have chosen to concentrate on. Focus on the elements that determine the design on several levels in the works.
- Studies of relevant literature within algorithmic composition, techniques, artistic perspective and more.
- Studies of relevant tools in addition to Csound (Python, Lisp, …)
- Programming of the basic modules in the instrument.
- Exploration of techniques for "intelligent live sampling", phrase recognition, catch and store characteristic traits related to the input source of sound
- Composition of etudes, individual compositions based on the chosen techniques
- Exploration of digital audio processing techniques, find new relevant combination of techniques

3 Development/Production (October 2005 – December 2006)

In this phase, techniques and experiences from phase 2 will be transformed into a unique instrument that is to be tested in concrete projects

- collection of techniques and implemented part programs to one "master instrument", ImproSculpt version 4
- potential work with audio installations (Flyndra, Hjulet, Vannsurround) *
- Potential cooperation with Statoil regarding sound setting of a control room **
- Cooperation with the jazz department/NTNU for the testing of approaches and techniques.
- Ensemble playing with other musicians for practical testing.
- Concerts and recordings.

4 Documentation (November 2006 – September 2007)

- Written user manual for the software that has been developed during the project.
- Bug fixing of the software that has been developed during the project.
- Collect and systematize the written material that has been produced

during the project.
- Formulation of insights and description of methods.
- Completion, proofreading and publishing of articles.
- Lectures/instruction/workshops at NTNU, NOTAM, Igualada Summer Course, and others.

The various phases have been time-scheduled as described above. It is inherent in the project that some tasks are active during all of the project period and that some tasks may be carried out in another order than as described.

** remark:*

Flyndra, Hjulet, Vannsurround
These are potential sound installations that contain artistic relevance to themes in the project.
Flyndra (The Flounder): sound setting of Nils Aas' sculpture Flyndra (The Flounder), Muustrøparken in Inderøy. The installation is envisaged executed as a sound picture in constant change, influenced by the time of year, the time of day, light and temperature. In composition terms, the work's dynamic nature will be well suited for exploiting techniques that are described in the scholarship application. The intention is to use a loudspeaker technique that transfers the sound to the metal of the sculpture, so as it appears as it is the sculpture that produces the sound.
Hjulet (The Wheel):an idea at an early stage. A loudspeaker element is fitted in the periphery of a wheel with a diameter of about 1 m; when the wheel rotates, Doppler effects will occur. If the wheel rotates fast enough (in excess of 100 rounds per second), the loudspeaker element will break the sound barrier. I envisage an interdisciplinary cooperation at NTNU in order to look into the technical aspects of the installation. The installation may be used as an instrument during a performance, or as an automotive installation.
Vannsurround (Water Surround): an idea at an early stage. 5 loudspeaker points spread out on a relatively large area, 30 - 50 meter between each loudspeaker. The loudspeakers are to be placed close by or on a water surface. The sound waves move more easily on a water surface so that the sound may be perceived clearly at a listening point about 50 meter from the loudspeakers. Exploits the time-lag that occurs because of the distance between the loudspeakers.
For all the sound installation works, reservation is made as to practicality and financing with respect to execution. If the sound installations are not produced, a greater part of the activity will be directed to ensemble playing with other musicians.

*** remark:*

Sound setting of control room
Statoil has expressed interest in employing sound setting of data linked up to a control room for the company's activity. I envisage a trail of thoughts in line with film music, in which critical levels in the measuring instruments are equipped with musical properties. A structured approach to algorithmic composition may facilitate such a project. Relative to the scholarship project, input from the measuring instruments will constitute the dynamical element, in line with improvisation during concert performances.
Similar projects may also arise as a cooperation with ntnu/petroleum technology for the exploration of similar principles on a smaller scale.

Budget / Issues related to economy

- Operating costs for specialist literature, software, project means, travels to see the teaching supervisor as well as study travels are covered by NTNU, both in the form of direct contributions through the scholarship program as well as through other available operating means from NTNU (the use of overhead means) Such costs are estimated at NOK 75,000 per year.

- Necessary time in recording studio is also covered by NTNU as the research fellow may make use of NTNU's recording studio in Olavshallen in his work.

The project as described in the scholarship application is feasible within the above frames.

Some special technical equipment may become necessary (sensors, physical control surfaces etc.)
These costs are assumed covered through income from projects the research fellow carries out during the scholarship period.

It is considered natural that the research fellow maintains a certain artistic production,
in which the projects are selected with reference to their relevance to the scholarship project.
Such external projects will make for a certain potential for income which may be employed for covering special equipment. Existing plans include sound installations, sound composition for control room (Statoil/Soundscape) and performing activity.

The existing cooperation with Soundscape is continued, hereunder exchange of technical equipment and competence.