Real-time control and creative convolution

Exchanging techniques between distinct genres

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ABSTRACT

This paper covers and also describes an ongoing research project focusing on new artistic possibilities by exchanging music technological methods and techniques between two distinct musical genres.

Through my background as a guitarist and composer in an experimental metal band I have experienced a vast development in music technology during the last 20 years. This development has made a great impact in changing the procedures for composing and producing music within my genre without necessarily changing the strategies of how the technology is used. The transition from analogue to digital sound technology not only opened up new ways of manipulating and manoeuvring sound, it also opened up challenges in how to integrate and control the digital sound technology as a seamless part of my musical genre. By using techniques and methods known from electro-acoustic/computer music, and adapting them for use within my tradition, this research aims to find new strategies for composing and producing music within my genre.

Keywords

Artistic research, strategies for composition and production, convolution, environmental sounds, real time control

1. INTRODUCTION

The relationship between electro-acoustic and rock/metal music (as a part of the popular music umbrella) has a complex history relating to musical directions, intentions, the use of synthesis and manipulation. Nevertheless it can be said that both genres have embraced and integrated the technological tools made available at their present time. Even though there are several arguments pointing towards a blending of the use of technology between the genres, there are still many transfer possibilities and potential for exchange.

In my field the utilization of digital sound technology to a large degree still follows the same mindset that has been developed through the history of analogue sound technology.
It is therefore a large resource of unrevealed potential in contemporary technology for use within my genre.
In this research I address the following question:
How is it possible to transfer methods and techniques from one tradition to another without loosing the idiomatic characteristics of a genre, and how can you use this knowledge to add new aesthetics?

2. METHODS AND TECHNIQUES

Throughout the project the course of events has consisted of three main stages:
1. Studying and interpreting a selection of methods and techniques within electro-acoustic music and how to receive experience based knowledge of its possibilities and limitations.
2. Translating and adapting these methods and techniques for practical use within my genres aesthetics.
3. Proposing different ways of controlling these as an extended part of the instrumentation within my genre.

The focus areas throughout these different stages have been:
2.1 The studio as a compositional tool
2.2 Musical integration of environmental sounds
2.3 Creative use of convolution
2.4 Real – time control

2.1 The studio as a compositional tool

In maintaining the content of this progress, it was an obvious consequence to start with the sound studio as a framework and basis for several reasons. The sound studio has been a mutual point of focus and also a necessity for developing the aesthetics of both electro-acoustic and popular music. At the same time this meeting point divides these genres when it comes to working procedures. While electro-acoustic music has an acousmatic tradition being composed in a studio environment, the tradition within rock music is that recording normally takes place at the end of a composition process. In other words, the composing and rehearsal takes place in a dialog process between the different performers in real time. The use of the sound studio early in this process therefore leads to a challenge in how to maintain this dialog principle. In the electro acoustical tradition the division between the composer and producer has in some degree been absent. Within popular music this situation has been the opposite. In this case the producer becomes an important part of the 'so-called' music industry, and is given credibility as a part of the creative process. As early as 1978 Brian Eno talked about the obliteration of the composer/producer role within popular music when developing his ambient music.[5] He suggested that the sound studio as a compositional tool was one of the clearest characteristics in new music, and that this would become the main focus for compositional attention in the future.[3] Even though the DAW to a large degree has replaced the traditional recording studio, and the compositional procedures within popular music shifts against a use of the DAW earlier in the process, several of the mentioned conventions are still present. So how is it possible to reveal more of the potential in contemporary technology for use within my genre?

2.2 Musical integration of environmental sounds

The use of environmental sounds as building blocks in compositional works has been a significant progression within the electro acoustic tradition. Ever since musique concrete in the 50`s and up until today this direction has been developing, and is still a basis for different musical directions and expressions. This aesthetical approach is relatively unexplored within my genre. Working with environmental sound challenges the sonorous attributes within my genres conventional expression, but it also raises the question of how to control and integrate pre-recorded material as a part of a real time performance. In my research the selection of sounds has mainly been focused on industrial noise.[11]

Sound example 1:

This is a preview of a composition build up of drums, vocals, angle grinders, trains, boats and chains. The recordings of the angle grinders and trains are edited, tuned and organized as tonal instruments, the boats and chains as percussive instruments.

2.3 Creative use of convolution

Convolution tools have been available for composers since the early nineties[10]. In popular music they are most commonly used in reverberation units where they are based on recorded impulse responses from different rooms. These impulses are then stored in order to be convolved with a desired input. In addition to this approach there are no limits as to which sounds that can be convolved with each other, and the exploitation of these possibilities is where the research of this projects aims. Other examples of approaches to this technique is Roberto Aimi`s percussion instrument [1], or "the sound of touch" [4]. A more creative use of this technique can be found in some of Barry Truax`s works[13] within art music, or The Soundbyte`s "City of Glass"[12] within a popular music genre. As far as I am aware there has been very limited documented artistic research on convolving different sound sources with each other, and because of that most descriptions of use are focused more on technical than aesthetic aspects.[10] By using a wide variety of different environmental sounds as impulse responses this project has explored which possibilities and limitations convolution between digital sound files imply both at a micro level, but also in a broader musical context. This work has resulted in three different approaches.

2.3.1 Convolution in postproduction

The first approach to this work started with empirical experiments with a wide variety of pre recorded environmental sounds consisting of different attributes. The central aim through this experience was to be able to predict how different inputs and impulses would interact with each other, in order to control these parameters against a wanted output.

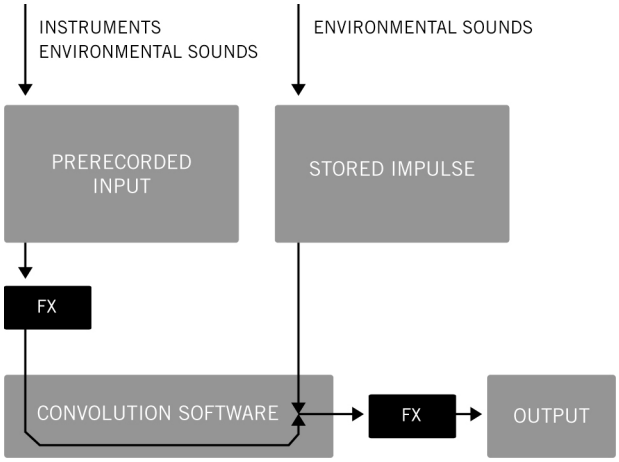

Figure 1. First setup

Sound example 2:

This is an example of a tonal approach, convoluting an electric guitar with the sound of a train**.**

Sound example 3:

This is an example of a rhythmical approach, convoluting handclaps with a recording of a chain

Sound example 4:

This is an example of both rhythmical and tonal approach put in a musical context

2.3.2 Real-time convolution

The second approach was finding ways to interact with this technique in real time by opening up a two-way communication between a musician and the output. In order to realize this two-way communication it was crucial that the musician was separated from the acoustic sound of the instrument in order to interact with the processed signal. This was maintained by feeding back the processed signal through headphones. By changing the impulse responses, and tailoring them to suit the present instrument, it was possible to affect the performance without the musician feeling unfamiliar with the mechanical presence or playing techniques of his own instrument. During these experiments both dry input signal and processed signal were recorded in order to analyze what caused the sonic changes, but also what made the musician make different artistic choices when interacting through this two-way communication.

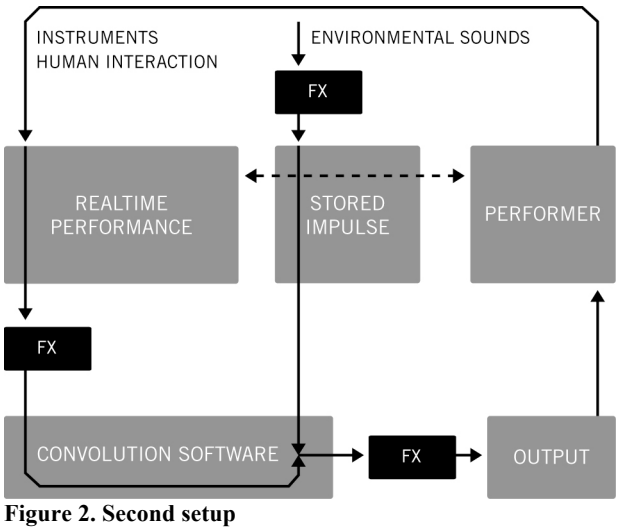

Figure 2. Second setup

Video example 1:
A video example of real time use of this set up (guitar and environmental sounds) together with real time convolution between drums and environmental sounds propose an artistic use of the points mentioned above.

2.3.3 The impulse sampler

The third approach came as a result of the experiences gained from the first two setups. The idea was to be able to record an impulse response and interact with it in a real-time situation. This setup gave the opportunity to sample impulses from my own instrument, other musicians or sound sources, and directly convolute them with another chosen sound-source in real-time.
The use of this setup gave several advantages. Firstly the implementation of this function made the whole process of trying different sounds against each other much faster and effective. Secondly the artistic value of being able to control samples of fellow musicians with my own instrument in real-time, opened up some exciting possibilities and results. The program was implemented in Csound, and runs in Ableton Live as a Max For Live device. [2]

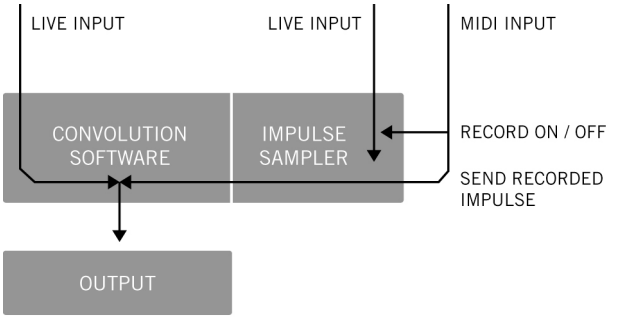

Figure 3. Impulse sampler
Sound example 5:
This is an example using the Impulse sampler to convolute a guitar with itself while playing.
Sound example 6:
This is an example using the Impulse sampler to convolute a guitar with an anglegrinder.

2.4 Real-time control

A challenge throughout the project has been finding ways to control these techniques in real time, and being able to use this in a musical dialog together with other musicians as an extended part of the conventional instrumentation. Since working in the studio in recent years to a large degree has changed from manoeuvring large mixing consoles to controlling everything through the DAW with a mouse and a keyboard, it felt natural to follow up on this workflow also in a real time situation. Even though there are several custom made interfaces for these operations on the market, few of them are made for integration on an existing instrument. As a guitarist both hands and feet are occupied at the same time concentrating on the guitar and foot pedals, disabling the player to handle a different standalone interface at the same time. The first step was to place a numerical keyboard directly on the guitar in order to control the DAW without interfering with the conventional playing. This solution opened up two different directions.

2.4.1 Controlling the DAW from the guitar

In a conventional guitar set up the closest solution for controlling a DAW lies in the use of a midi floorboard. Many of these floorboards already contain most of the functions needed for controlling both static and dynamic parameters in a software environment through its different stomp and expression pedals. At the same time this approach leads to a practical challenge in operating both the DAW and external hardware guitar processors at the same time from the same interface. The first approach was to attach a keypad directly onto the guitar in order to take care of the non-guitar operations in the DAW, and at the same time separate the control of the guitar processors and the DAW by using two midi floorboards.

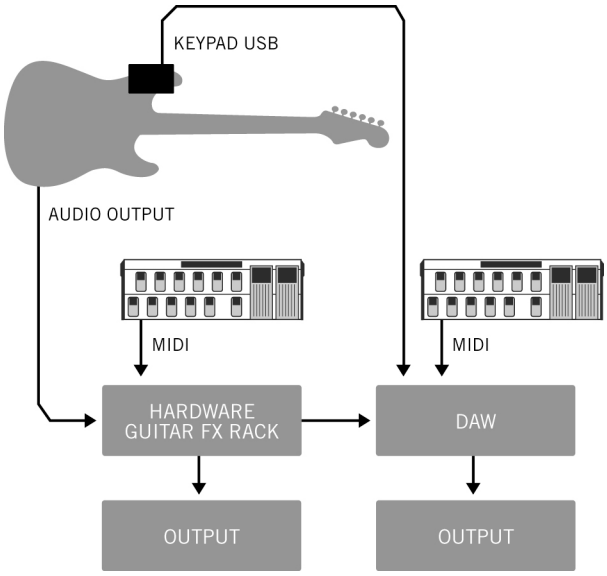

Figure 4. First setup

This figure can be seen as a miniature set up of a conventional studio event, and as a first attempt at bringing the traditional studio environment into the real time domain. Through this solution the traditional roles of the producer and musician are moulded together, but the system setup still consists of two parallel lines of control. This led to a search for a new solution where these roles were more seamlessly integrated with each other, and at the same time more individually flexible and comprehensive.

2.4.2 Augmentation of the guitar based on extended techniques

The functionality and practical use of contemporary digital guitar controllers are mainly based on a heritage stemming from electrical reproduction conventions, (different stomp boxes and expression pedals), resulting in a large amount of different digital floorboard and multi effects solutions. There are other approaches for digital augmentations of the electric guitar like the multimodal guitar[8] [9] or the Manson guitar[7]. Besides these there has been a limited documented research on digital augmentation solutions attached and controlled directly on the Electric guitar. At the same time the possibilities and functionality of tailor-made guitar software are poor compared to tools you find in most DAW programs, and it would therefore be natural to start with the DAW as a processing engine controlled from the guitar. From a musicians point of view it would be natural to integrate interfaces directly into the instrument, enabling real time control over the digital functionality without interfering with the playing of the instrument. The approach in this project has been to put together well-known and intuitive interfaces and to attach them directly to the instrument in order to control the digital software in real time. The direct integration of a keypad and a track pad enables a player to send both static and dynamical control

messages to different software and hardware in real time without removing the physical focus from the instrument or interfering with the idiomatic characteristics of the guitar. These interfaces are also very intuitive because of their use in other application on daily basis, and also quite inexpensive compared to custom-made solutions.

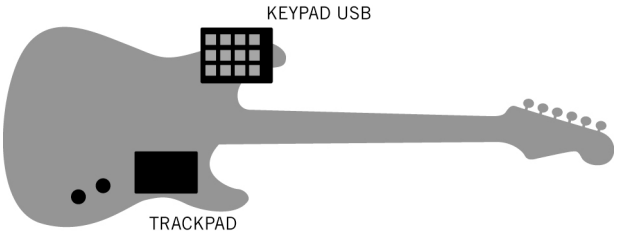

Figure 5. Placement of the interfaces

The physical placement of the two different pads was decided upon based on two well established extended, guitar techniques. The keypad was positioned in a typical guitar channel selector area, based on an on/off technique known as kill-switch.[6] The track-pad was placed in the volume/tone control area on the guitar based on an extended technique called volume swell. [14] The volume swell technique enables the player to use the volume knob dynamically without removing the right hand position from the instrument. This was the basis for the second guitar setup.

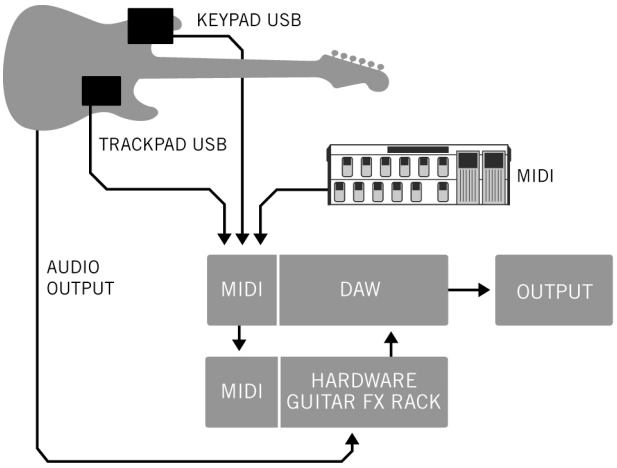

Figure 6. Second setup

This set up gave several advantages. First of all it gave the possibility of removing some of the components from the first setup without compromising the DAW control or preset changing in the Guitar-FX hardware. This was done by running all incoming control messages from the different interfaces directly through the DAW for mapping and further distribution. Secondly, the track-pad opened up an easier and more intuitive way of controlling XY parameters compared to using two expression pedals at the same time. The physical placement of the track-pad also contributed to the possibility of using the XY parameters without removing the right hand position as in contradiction to the Manson guitar system.[7]

2.4.3 Interface output

Both the keypad and track-pad outputs are translated to midi signals through two different Max For Live devices[15]. The keypad can be used to perform static operations like on/off and momentary messages. The track-pad can be used to perform dynamic operations like volume, morphing between different effects, surround sound operations or other applications demanding XY control.

Video example 2:
Demonstration of the guitar setup, using the track-pad as an XY controller in a granular synthesis plug in.

Sound example 7:
Demonstration of the guitar setup in a real-time improvisation with other musicians playing convoluted piano and percussion.

3. SUMMARY

This is still an ongoing research project, where all mentioned themes and work are constantly under a refinement process. The next step is to proceed with the research through an even more practical approach. This will be done by recording and doing concerts with different musicians within a real time context for experiencing points for further technical and aesthetical improvements.

4. REFERENCES

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5. Appendix

All sound and video examples can be found at:
http://thesoundbyte.com/nime