SYNCHRESIS audiovisiontales

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The expanded fortepiano

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Current uses of historical instruments, namely instruments associated with pre-Romantic periods, normally focus on canonic repertoires and musicological-based approaches. However, these instruments can encompass varied affordances, and several contemporary composers have explored their specific characteristics; the harpsichord, in particular, is featured in a significant number of solo and chamber contemporary works. Departing from these contemporary approaches, which explore compositional techniques and acoustic possibilities, this research has focused on a specific historical keyboard instrument, the fortepiano, in order to expand its historic features through the use of contemporary techniques of sound design. Nowadays, the manufacture of fortepiano copies nearly always omits an important feature of these instruments, namely the added devices, known as Veränderungen or stops, which were used to alter the sound normally produced by the hammers. The sustaining pedal, for example, is one of the devices (along with the una corda pedal) that has survived subsequent alterations of the instrument's design. Devices were usually operated through hand-stops or pedals, and produced percussive or timbre-altering effects (Cole, 1998; Latcham, 2008). This proposal addresses two research questions, departing from the concept of instrumentality (Bovermann et al. 2017) and post-experimentalism (Gilmore, 2014): is it possible to digitally re-create devices that are no longer available in modern copies of fortepianos and propose alternative and experimental versions of period keyboard repertoire? Do the ensuing alterations modify instrumental perception and can they contribute to the creation of alternative performing solutions, namely in association with improvisatory practices and sound synthesis? In order to address these questions, this research pursued the following interconnected and chronologically ordered lines of investigation: 1) review of organological studies in order to map current knowledge and characterization of the devices associated with fortepiano building (18th and early 19th century); 2) use of microphones, piezoelectric sensors, cameras and other electronic devices, to undertake sound and motion caption in order to test techniques of sound synthesis, sound triggering and algorithmic composition with the programming environment Max/MSP/Jitter; 3) studio work, undertaken in order to apply the applications created in the previous task; 4) creative work, involving historical repertoire, composition, and free improvisation techniques; 5) final characterization and description of the developed applications, along with the recording of artistic outputs. The research has exposed the limitations of the digital production of effects if merely considering historical criteria. It has highlighted, however, a set of techniques and procedures that potentially can contribute to the deconstruction of the standard perception of historical keyboard instruments, and to the creation of new experimental paths for performing and improvising on the fortepiano through the mediation of electronic interfaces and digital sound objects.

Context

Current uses of historical instruments, namely instruments associated with pre-Romantic periods, normally focus on canonic repertoires and musicological-based approaches. However, these instruments can encompass varied affordances, and several contemporary composers have explored their specific characteristics; the harpsichord, in particular, is featured in a significant number of solo and chamber works after the second half of the 20th century. Departing from these contemporary approaches, which explore compositional techniques and acoustic possibilities of historical instruments, this research has focused on a specific keyboard instrument, the fortepiano. The designation "fortepiano" is currently used to distinguish pianos manufactured before the mid-19th-century from more recent models. This is not a standardized use of the term, nor one that has been validated by research, but it would be nearly impossible to propose a more adequate terminology, considering the variety of instruments in this family, and the fact that the "modern" piano itself is basically a copy of late-19th-century designs.

Research and artistic motivations spurred the undertaking of this project. We have been engaged in the performance of experimental and/or contemporary music for a significant part of our careers, and the choice of the fortepiano as a resource for this line of investigation is connected to former projects involving the performing / recording of contemporary music for this instrument. This was also the basis for our interest in exploring its potential for contemporary performance, linked to its specific timbral features and to the affordances of its historical devices, not always available in current copies.

In fact, while the manufacture of fortepiano copies is thriving nowadays, builders nearly always follow standard designs of a few staple and paradigmatic models, such as the late-18th/early-19th Viennese fortepiano by Stein or Walter, or early 19th-century British designs by builders like Broadwood. Few contemporary fortepiano builders manufacture instruments with some of the added devices, known as *Veränderungen* or stops, which were used to alter the sound produced by the hammers in several models, from the early 18th to the 19th century. Devices were usually operated through hand-stops (in earlier models) or pedals, and produced percussive or timbre-altering effects. Several builders, in the 18th and 19th centuries, developed models with a significant number of timbre-altering devices. For instance, a recent copy of a Graf fortepiano from 1819, built by Paul McNulty, features six different pedals: *una corda*, fagott, single moderator, double moderator, sustaining, and the Janissary, which combines drum, bells and cymbal sounds. Not all pianos had as many devices as this Graf model, but several instruments did include other effects apart from the sustaining pedal or the *una-corda* pedal, two of the few devices that have survived later alterations of the instrument's design. Our perception of Classical and early Romantic repertoire could be conditioned by the fact that it is often played on "modern" pianos, which have only these sustaining and *una corda* (in fact, *due corde*) pedals, and do not present the affordances and effects that other devices added to this repertoire and its performance. Moreover, few printed sources and scores include instructions regarding the use of these devices, and, for most cases, anecdotal information is the only type of information that has reached us. For example, at the time of the composition of Mozart's *Alla Turca* (the last movement of the A-minor Piano Sonata, K331), drum and cymbal stops already existed, according to Ahrens (2006), but the Janissary, which combined these two effects and sometimes bells, was not patented before 1795, after Mozart's death. Still, this work is a well-known example of the type of repertoire that could be "enhanced" by these devices, as these stops became more common in some models of fortepianos, namely in German-speaking geographical areas. The devices were added to many different models of fortepianos, and their use was maintained well into the 19th century. Nevertheless, the sound image we have of idiomatic fortepiano repertoire does not encompass these affordances: we associate the repertoire with a specific type of piano sound, enhanced only by the use of the sustaining pedal, and, less often, by

the timbre alteration of the *una-corda* pedal. An awareness of this historical variety in instrument design (which is not always available in contemporary fortepiano copies) was an additional motivation for our project.

Research questions, aims, and design

This investigation addresses two research questions, departing from the concepts of instrumentality (Bovermann et al. 2017) and post-experimentalism (Gilmore 2014): 1) Since not all sound-altering devices are normally available in modern copies of fortepianos, how can we conceive and apply experimental alternatives? 2) How do the ensuing alterations modify instrumental perception and contribute to the creation of alternative performing solutions, namely in association with improvisatory practices and sound synthesis?

This study's design encompasses 5 interconnected and chronologically ordered tasks, in order to pursue the aims of developing a digital expansion of fortepiano features, using techniques of sound design and programming, and of studying how these interact with the performing and improvising processes:

1. reviewing organological studies in order to map and characterize the devices associated with the fortepiano, and their impact on the sound perception associated with this instrument;

2. using microphones, cameras and other electronic devices, to undertake sound and motion caption in order to test techniques of sound synthesis, sampling and programming with Max/MSP/Jitter;

3. testing the applications created in the previous task while undertaking studio work;

4. creative studio work, involving historical/contemporary repertoire, free improvisation and the tested applications;

5. final characterization and discussion of the developed applications and the artistic outputs.

These tasks constitute the research plan of an on-going artistic-research project: we have addressed, to date, the first 4 tasks, but we are still in the process of testing and experimenting new strategies. This article will thus focus on the methods employed so far, and will present some preliminary and partial results of the overall project.

Expanding the fortepiano

When we started our experimental work, reinventing staple repertoire through the creation of digital effects comparable to historical stops was one of the core ideas, but we rapidly understood the artistic limitations of superposing historically-inspired effects on the performance. Nevertheless, pre-existent repertoire provided relevant material for the initial sessions: Mozart's *Alla Turca*, and the first movement of Beethoven's "Moonlight" Sonata, Op. 27 No. 2, but also more recent works: *Octavia' threads*, by Brazilian composer Jônatas Manzolli, and John Cage's *In a Landscape.* Cage's piece proved particularly interesting to work on: composed for piano or harp, its suitability for fortepiano is also remarkable. Therefore, we decided to focus on this piece and on some of Cage's work modalities, namely the use of randomization and chance procedures, associated with the experimentation with timbral effects. In short, revisiting the late 18th century and early 19th century fascination with effects, but applying contemporary sound design tools and experimenting with a new approach to the concept of added device.

Our work materials included: as hardware – a copy of a 1804 Walter fortepiano, a Mac Book pro, Røde NT5 microphones, a Roland Rubix 22 soundboard, a M-audio Code 25 midi controller, iRig pads, and Roland Cube Monitor loudspeakers; as software – Mira for iPad, Ableton Live, Max/MSP/Jitter, Max for Live, and Native Instruments Reaktor.

One of the first tasks involved the creation of *Xpanded Fortepiano*, a Max MSP patch (Fig. 1). This patch records music sections chosen and played by the performer while performing live, and then reads audio slices randomly chosen, with regard to their extension and location in time. It then applies pre-selected effects to these materials as they are played back, as the basis for a dialogue with the performer that can engage with performances of musical texts, improvisations or a combination of both.
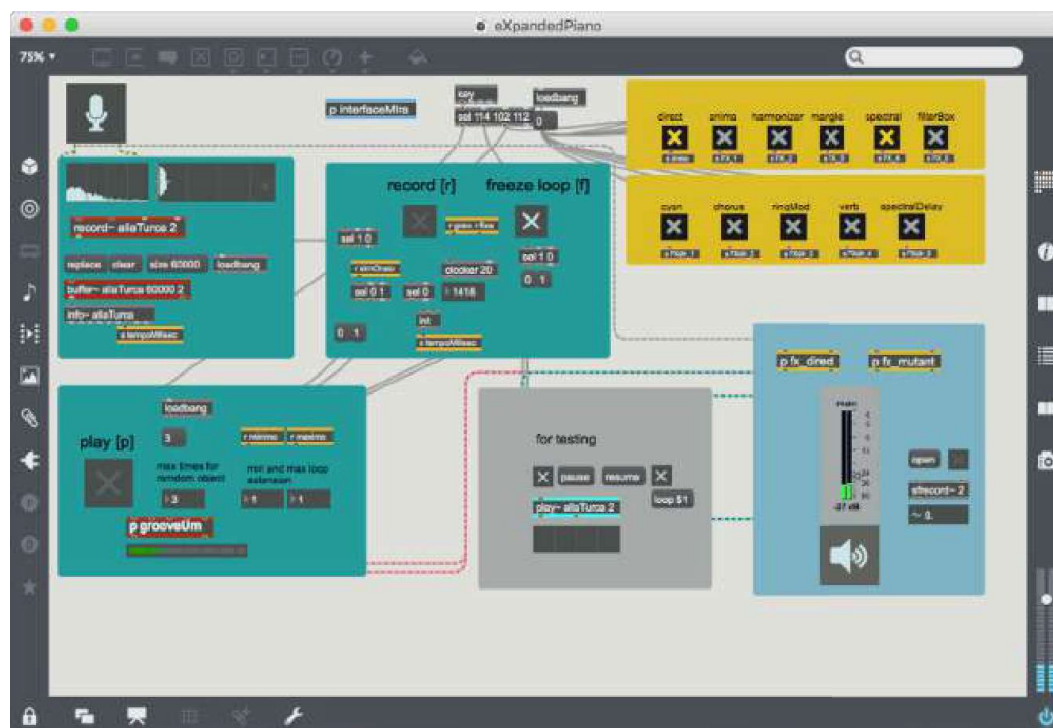

Figure 1. *Xpanded Fortepiano* patch

The patch has the following functions, in more detail:

1. it records audio excerpts of music performed live; the moment and extension of the recordings can be set by the performer, or by a collaborating partner at the computer;

2. at the core of the patch is an object called 'groove', which has the capability of reading audio samples from any point, changing pitch and speed, whether pre-programmed or randomly. We chose, following our Cagean approach, the random mode;

3. the performer or the collaborating partner can select some of the characteristics of the audio samples, namely:

    •   the duration of the audio samples, setting its highest and lowest range in milliseconds, which is then randomly chosen by the patch

    •   the number of repetitions, which is also set by selecting its highest and lowest number, for example, from 1 to 8, which is also randomly chosen by the patch;

4. the resulting altered audio excerpts are played back, and the audio signal of the samples passes through one or more effects processors;

5.   the effects we used so far were selected from software packages such as Native Instruments Reaktor and Max for Live.

For practical purposes, a control panel for iPad was designed, built in Mira software, which could be used from the fortepiano keyboard (Fig. 2). This panel allows the player to autonomously start and stop the recording, freeze a selected loop, set the loop extension, and select one or more effects from a set of five, while playing in dialogue with the resulting audio outputs.

Some examples of performing / improvising outputs can be heard via these links: https://soundcloud.com/user-877190385/expanding-the-fortepiano-sample-1; https://soundcloud.com/user-877190385/expanding-the-fortepiano-sample-2; https://soundcloud.com/user-877190385/expanding-the-fortepiano-sample-3.
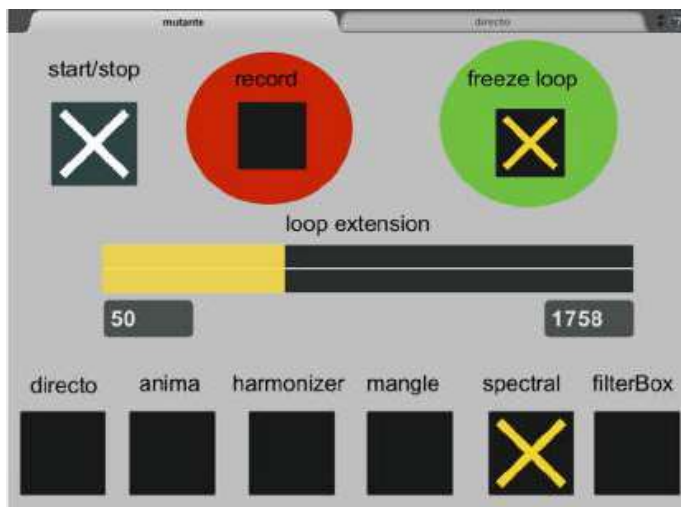

Figure 2. Control panel for iPad

These sessions have identified some issues that will need to be addressed in the future, namely: varying the choice of effects through synthesis; improving tools that can further optimize the performer's autonomy; identifying patterns of improvisation that can engage more effectively (technically and artistically), and with less pauses, with the task of setting loops.

Concluding remarks

Till Bovermann has pointed out that the concept of "instrumentality, taken as a specific quality of musical instruments, may serve as a starting point for observations from the most diverse backgrounds that seek to comprehend how exactly our interaction with and our conception of musical instruments has changed through digital technology" (Bovermann, de Campo, Hardjowirogo, & Weinzierl, 2017, p. 2). We believe that historical instruments are also an interesting point of departure for experimental creation. We also believe the mere historical re-construction of effects through digital procedures presents obvious aesthetic limitations. We will thus proceed to map performing techniques, creative procedures and digital applications. We hope to contribute to the deconstruction of the standard perception of the sound of historical keyboard instruments, and to create experimental paths for performing and improvising on the fortepiano through the mediation of electronic interfaces and digital sound objects.

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