FOR JEAN-CLAUDE: [RE]PRESENTING *DUET FOR ONE PIANIST*

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ABSTRACT

In 1989, composer and researcher Jean-Claude Risset's series of interactive sketches for piano and Disklavier entitled *Duet for One Pianist* explored the performative possibilities made available to pianists through the augmentation of emotive human musical gesture with the precise reactive and computational capabilities afforded by computer-based musical systems. As computer and musical software systems have evolved, the Max software patches created by Risset and researcher Scott Van-Duyne at the MIT Media Lab have been updated and maintained to allow the pieces to be performed using contemporary hardware and software systems. In distinct contrast, Risset's original hand-notated musical score for the work - representing performance notation for the human pianist alongside a varying level of detail representing the computer's response, itself an integral part in the work - remains the authoritative representation available to performers, researchers and archivists alike. This paper outlines ongoing efforts towards the augmentation of Risset's existing score through the production of a comprehensive multi-voiced notated score edition of *Duet for One Pianist*, as well as symbolic and data representations for each of the eight works derived from live performance data, and a complimentary and complete series of audio and visual recordings of *Duet* by pianist Chryssie Nanou.

1. INTRODUCTION

Technology based musical works often face serious barriers to their sustainability as performable repertory as the hardware and software systems used in their creation and recreation pass from state-of-the-art into a state of disrepair and then often into an eventual dissolution. As technology continues its incessant and increasingly rapid march into the future, it is important to consider what elements are necessary to preserve and recreate any given work of electronic, electroacoustic or computer mediated music. Software systems can be created to recreate obsolete musical hardware functionalities as well as obsolete musical softwares but only if the core musical and procedural information that make up the work as a whole can be preserved and formatted in a manner that can be understood by researchers, musicians and musical systems of the future.

The issue at hand is clearly the preservation not of the specific software or process used in the creation of electroacoustic works but in the preservation of the work itself in a meta-format from which new and faithful recreations of the work can be created using any number of hardware and software approaches. There needs to be a basic representation of the processes used, analogous to the traditional musical score, itself a depiction of the music from which an accurate performance true to the composers intent can be generated.

The nature of Risset's *Duet for One Pianist* with its precise and repeatable MIDI transformations of player input allows and will allow for the accurate recreation of the work using various current and future software systems. While Risset and Scott Van-Duyne's original software was built using an early version of Miller Puckette's Max software, the clear and concise nature of the musical transformations being carried out in each sketch would allow for the recreation of the work in a number of software languages without changing the musical work as a whole. In fact, by simply creating a musical reference score of the entire work, including detailed musical depictions of each musical transformation and reaction required by the computer system, the necessary information required to recreate Risset's work could be preserved in a software and hardware agnostic manner.

2. DUET FOR ONE PIANIST

At their highest level of functional abstraction, the eight sketches that comprise Risset's *Duet for One Pianist* essentially receive incoming MIDI messages, enact score-following behaviors through an analysis of the incoming MIDI stream, carry out predefined dynamic or static processes designed by the composer, and subsequently generate an outgoing MIDI stream of these processes to be fed back to the Disklavier itself for acoustic rendering. These processes can be transformational in nature (i.e. the generation of a transposition or reflection of incoming pitches centered around a specified pitch) or can be wholly pre-defined (i.e. a static chord or arpeggio generated from a composed note-list). All actions and reactions in the eight

sketches are triggered by the pianist's playing of a predetermined note or note sequence, including performance speed and dynamic level. Risset himself describes the work as such:

"In my *Duet*, I have explored some simple compositional relations between the pianist's part and the computer's part: translations or symmetries in the time-frequency space (that is, pitch transpositions or interval inversions); triggering by the pianist of specific patterns (e.g. arpeggios) or stored musical sequences which can be influenced by certain performance parameters (for instance, the tempo of the sequences follows the tempo of the pianist; or this tempo is a function of the loudness of the notes played by the pianist); canon-like imitation (the computer plays a melody derived from that played by the pianist by transposition and change of tempo)." [6]

3. PRIOR WORK

The need for viable methods of documenting and recreating interactive electroacoustic musical works has been well documented yet still continually threatens the viability of the growth and maintenance of a sustained performance practice for interactive computer-based musical performance. Ongoing efforts to design and provide solutions for the archiving, maintenance and recreation of classic electroacoustic works are currently being pursued by a number of large and smaller-scaled efforts.

Featuring interactive versions of works such as Karlheinz Stockhausen's *Mantra* and Phillipe Manoury's *Jupiter*, the PD Repertory Project [5] headed by Miller Puckette seeks to create open source and public-domain versions of classic electroacoustic compositions using Puckette's Pure Data (PD) software. Similarly, the Integra Project [3] - currently being pursued by a consortium of research centers and performance ensembles - defines as one of its primary goals the "migration of existing repertoire using obsolete technology" to their own new open-sourced software environment. And the Mustica Initiative, developed as part of the more sweeping InterPARES 3 Project [1] brings together a number of international research centers working towards the development of strategies and software tools capable of archiving and recreating the complex informational systems for interactive musical works.

While such projects seek to devise standardized methodologies for the archiving and preservation of complex multimedia works incorporating data and resources for sound, visual art and user-generated performance data, smaller-scale approaches focused on the recreation and maintenance of specific works in the electroacoustic repertoire can be extremely successful as well. A 2007 recreation of Dexter Morrill's *Sea Songs*, for Soprano voice, computer-generated tape, Radio Baton and Digitech TSR-24 stereo-effects processor used Max/MSP to build a software model of the TSR-24 as well as its interactions with the Mathews Radio Baton, enabling the work to be performed once again without relying on out-of-production hardware.

4. SOFTWARE MODIFICATIONS

While all analysis and performance for this project has been carried out using Risset's own software patches, a number of modifications have been made to Risset's Max patches during the course of this project.

4.1. OS X Patch Updates

During a 2007-2008 residency by Risset at Stanford's CCRMA, Risset's working Max patches for Duet were updated from his own PowerPC Apple OS 9 version of Max to run on Max/MSP version 4.6 on Apple OS X for Intel processors. Modifications made to Risset's patches were straightforward and primarily involved replacing a number of obsolete or unsupported older Max objects with newer supported objects, as well as the addition of a more easily configurable system for managing each sub-patch's MIDI input and output devices.

4.2. MIDI Recording

To create an accurate and representative data model of each piece, the CCRMA version of Risset's Max patches were modified to allow for the separation and synchronized recording of individual MIDI streams for both incoming MIDI messages (generated by the performer on the Disklavier) and outgoing MIDI messages (generated by Risset's software). By isolating each stream and recording them in a time-synchronized two-voice MIDI file directly from Max, a fairly accurate representation of a given performance of the works by pianist Chryssie Nanou could be saved and used as the basis for generating and editing a notated version of each piece's computer-generated parts. During audio and video recording sessions, MIDI data from the Disklavier as well as the output from Max were recorded side-by-side with the audio and video outputs for future use in the creation of a multi-media recording and data-model of the works.

5. SCORING METHODOLOGIES

To create an accurate and representative notated score of computer-generated MIDI output from Risset's *Duet*, a number of steps have been taken with the goal of both building an accurate and visually intuitive notated score for the work as well as compiling an accurate data model upon which future analysis and study can be performed. The score-creation process itself involved two primary phases: the manual type-setting of the original Risset score and the capturing and analysis of performance-generated MIDI output representing the undocumented musical transforms enacted by Risset's software. The manual setting of the original Risset scores has required relatively straight-

forward editorial choices, primarily involving aesthetic decisions balancing respect for the composer's own original scoring layout with a forward-looking expectation of need for additional vertical and horizontal space in specific sections to allow for a clear representation of the computer-generated voices.

5.1. MIDI to Finale

As a completely automated approach towards generating a notated score based on the recorded MIDI stream would require intense and rather arbitrary pre-defined levels of MIDI quantization, thus negating most of Risset's non-temporally standard phrases, MIDI data was instead imported into the Finale notation software and manipulated by hand to generate rapidly-prototyped pitch and rhythm reference layouts, which in turn served as the basis for the final human-mediated SCORE notation. Finale's ability to export data into the MusicXML format has also proven useful in the analysis of each work.

5.2. SCORE

To carry out the task of inscribing Risset's original hand-written score, Leland Smith's SCORE notation language was chosen chiefly based on it's extremely high quality of printed output [9]. While the use of newer musical notations softwares such as Finale or Sibelius could have produced acceptable results with a somewhat shorter project timeframe, the superior printed output, high level of detail and the available resources provided by Stanford University's CCARH[1] - itself a hot-bed of academic and commercial SCORE use - supported the use of SCORE for final typesetting.

6. NOTATION EXAMPLES

Risset's approach to the notation of the computer-generated piano voices varies in attention to note detail from piece to piece and indeed from section to section. Occasionally, generated phrases are notated clearly while in other times, computer-generated arpeggios or similar notated constructs are represented by indeterminate graphic notations, such as seen in the following examples.

6.1. Extensions

In this example from the beginning of the sketch entitled *Extensions*, rapid arpeggiated figures performed by the pianist are repeated in two distinct voices at varying levels of transposition and delay. In Risset's original score, we see the computer-generated arpeggios represented by a single starting pitch and a generalized arpeggiation-figure, itself basically an upwards and downwards drawn gesture. While Risset does note the pitch and time transpositions at use in the score itself ("up 28 semitones, delay 125ms" for the first computer voice, "down 40 semitones, delay 420ms" for the second) performing or analyzing such a score at sight is extremely difficult if not impossible for most musicians.

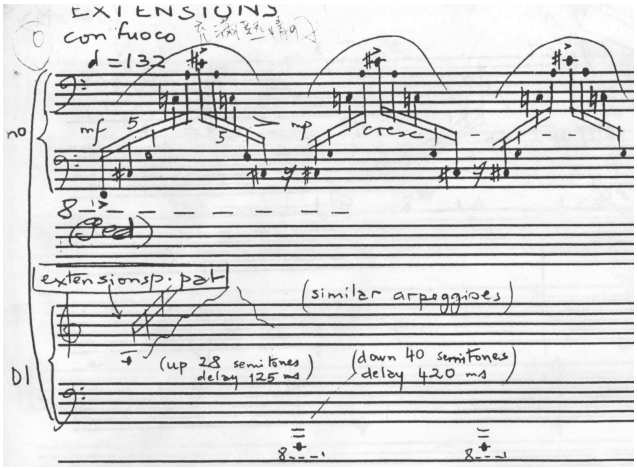

Figure 1. Computer-performed transformations of piano input represented by graphic arpeggios in *Extensions* m. 1

Figure 2 shows the same example with a completely notated set of computer voices, both improving the performability of the work as well as representing all the musical data necessary to completely recreate such an example in a variety of software systems.

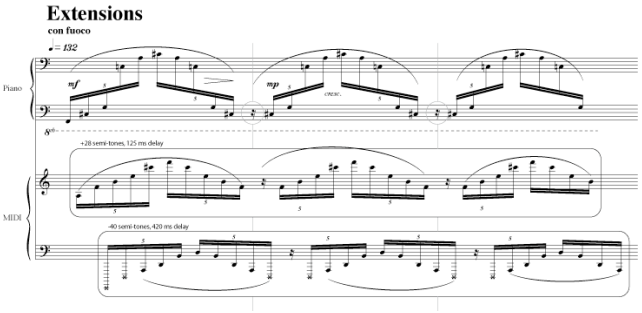

Figure 2. Fully-notated computer-generated arpeggios from *Extensions*, m. 1.

This setting of *Extensions* showcases an interesting point to note that as the works themselves were written for and on a MIDI piano, the output generated by a number of Risset's transformations occasionally exceed the capabilities of the piano itself (generating notes above or below the MIDI range of a Disklavier), causing silences during performance. To accurately represent such phrases in notation, the shape of the original performed gesture must be retained while the silenced MIDI pitch - itself already integrated into the composition of the work by the

[1] Center for Computer Assisted Research in the Humanities, Stanford University, www.ccarh.org

composer - must also be correctly notated. Such an example occurs within this excerpt, as the lowest computer generated voice reaches pitches with negative MIDI values, below the Disklavier's lowest pitch of MIDI value 3.

6.2. "Stretch"

In a similar example from the etude entitled *Stretch* (see Fig. 3), MIDI pitches performed by the pianist are transposed by a factor of 1.3, with simple integer rounding to keep each note within a tempered scale. As in *Extensions*, Risset uses a simple and effective graphical line to represent the basic concept of the computer's performance, augmenting the indeterminate notation with specific pitches which provide timing and phrasing cues to the pianist.

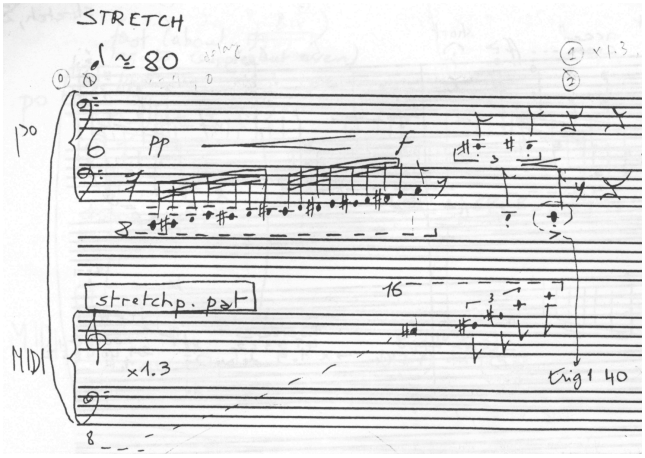

Figure 3. Generalized depiction of note pitch multiplication from the introduction to *Stretch*.

Again, by adding a clear notated representation of the notes being performed by the computer voice, performers and researchers alike can better understand Risset's intentions as well as use the score itself as a model for recreation of software processes.

7. CONCLUSIONS

While each of the eight sketches that make up the *Duet for One Pianist* are fairly short, the analysis, recording and setting of each work into a comprehensive archival set is still an ongoing process. At this time, recordings of each work have been made (audio and MIDI) and the prototyping of each score based on generated MIDI data has been accomplished. Based on Finale and handwritten prototype scores, the work to set each sketch in SCORE is ongoing with a projected completion date in the Fall of 2009.

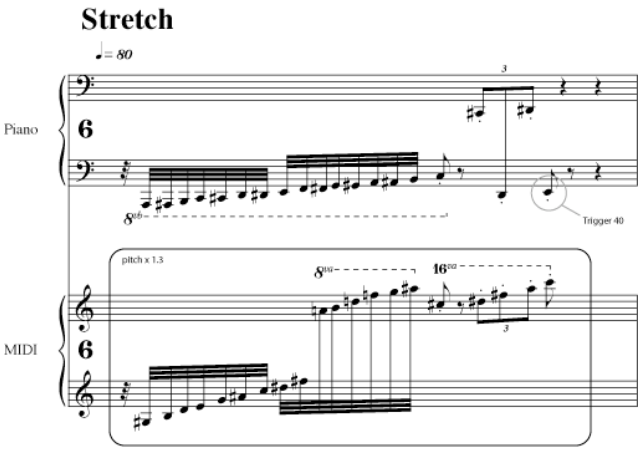

Figure 4. Note-pitch multiplication from *Stretch*.

8. REFERENCES

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