La Otra Voz for flute, clarinet, violin, cello and piano with electronics and real-time visual image

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ABSTRACT

La Otra Voz for ensemble, prerecorded electronics and real-time visual image, takes its inspiration from *Octavio Paz*'s "La Otra Voz". According to his poesy, we tried to search for invisible existence and inner voices with music and visual image. This paper will describe the musical material and structure, as well as the technical system for the visual image and the interactivity between it and the music.

INTRODUCTION

La Otra Voz was premiered by the Onix Ensamble at the Seminario de Música Contemporánea, Escuela Nacional de Música UNAM, Mexico in February 2010, supported by the Onix Ensamble, the CMMAS, and the Japan Foundation. It is a work for ensemble and prerecorded electronics and real-time visual image. Software such as Audio Sculpt, Open Music, Max/Msp and Max/Jitter were used as means of technological tools.

COMPOSITIONAL MATERIAL AND IDEA

The music is constructed with a multilayered complex sonority consisting of sounds of the ensemble, musicians' voices and prerecorded electronics, which focus on diversity while remaining consistent. It produces a subtle timbre with a simple, yet powerful symbolic gesture. Translations of the word "voice", ("voz" in Spanish and "koe" in Japanese) are notated in the score to be spoken by players to produce this mysterious atmosphere with symbolic messages, merged with breathing sounds and percussive sounds produced by instruments.

1. Ensemble Writing
The pitch materials are created from a part of the harmonic series on the root note D, other pitched spectra and D distorted harmonic spectra, analyzed by Open Music (see Figure 1), the musical results are shown in Figures 2.1, 2.2, and 2.3.

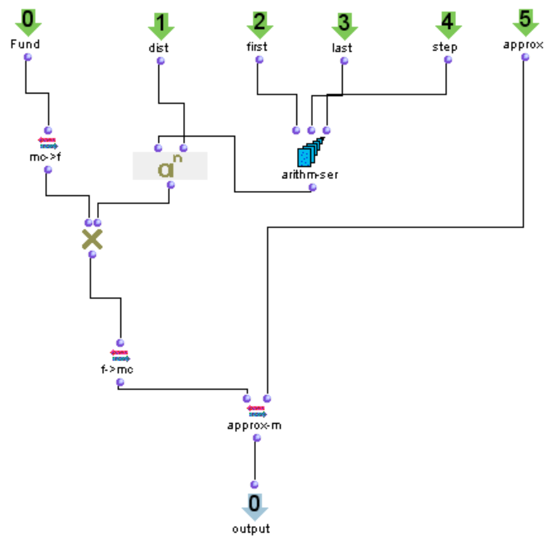


Figure 1: Harmonic distortion on the Open Music patch

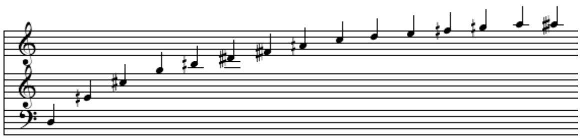


Figure 2.1: n=1.2 distortion on D

Figure 2.2: n=1.5 distortion on D

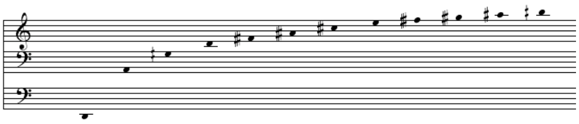


Figure 2.3: 50 partials chosen by 5 steps on D

Because of these results from the computer analysis, quarter tones are used (Figure 3).

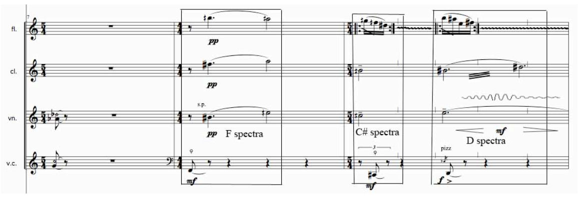


Figure 3: flute, clarinet, violin and cello in the score

As for the piano writing, there are four patterns with lowest-register's sounds at the first four measures from the beginning of the piece, used as a bass ostinato with different figurations through the whole piece (Figure 4). These piano patterns are also recorded to use in the electronics part.

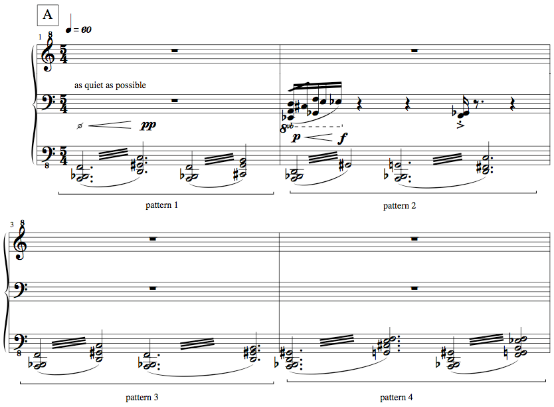


Figure 4: Piano patterns

Furthermore, in the middle section from rehearsal letter G, white noise-like sounds are created by breathing sounds in the flute and clarinet, knuckling on body and bowing behind the bridge by violin and cello, and the pianist striking on cross beams with fingernails, knuckling on the piano cover, and repeatedly up and down rubbing on the keyboard with flat fingers. This is meant to express a chaotic moment when a similar sonority emerges from the electronics part (Figure 5). This section is composed intuitively. The resultant sounds are merged powerfully with electroacoustic part, which itself is derived from percussive piano sounds, reversing the relationship between the electronics and ensemble.

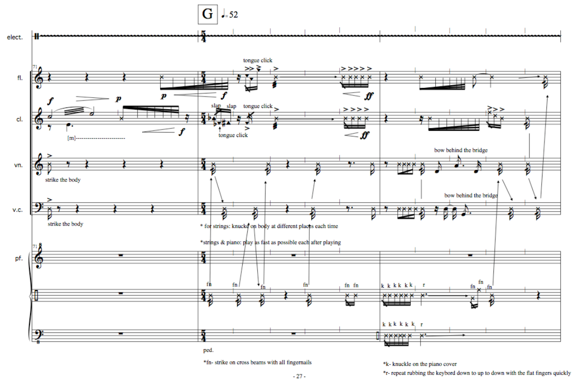
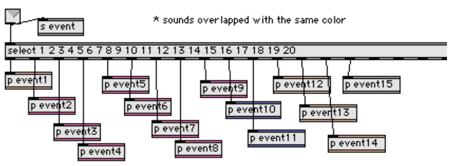


Figure 5: Excerpt in the middle section

2. Electroacoustics

There are fifteen soundfiles to be triggered by Max/Msp during the performance (Figure 6); each trigger point is precisely indicated in the score. The soundfiles are superimposed; depending on the situation, and often corresponds with an on-stage instrument. These soundfiles (processed by software such as Audio Sculpt and Max/Msp) were created using the recorded materials of piano, maracas and rain stick, and white noise. Just as the real (non-transformed) maracas are also used by players, the electroacoustic part uses similar transformed audio materials.



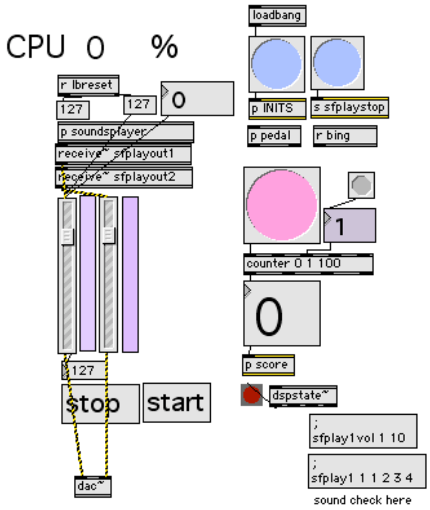


Figure 6: Max/Msp concert patch

The recorded piano materials are used from four patterns with lowest register (Figure 4) and percussive sounds (Figure 5). There are 79 excerpts that were recorded from piano. The piano materials and white noise were all processed by AudioSculpt and eventually combined to form the fifteen soundfiles. In total, 138 electronic sounds were processed by Audio Sculpt using the following treatments:

1) Transposition: -1200 cents, -2400 cents, creating much lower register's sounds.
2) Band Filter
3) Dynamic Transposition: glissando effect.
4) Clipping Filter
5) Time Stretch: 5 times or 6 times stretching.
6) Formant Filter: focused on both vowels "o" and "e", which come from the words "koe" in Japanese and "voz" in Spanish.
7) Generalized Crass Synthesis: filtering with white noise.

The other effects are used within Max/Msp for the sounds originally from the piano, maracas and rain stick. Both the harmv2b~ object for harmonizer and the fshift1~ object for frequency shift are used. Transposition smoothing for the harmonizer patch causes the glissando effect (Figure 7 and 8).

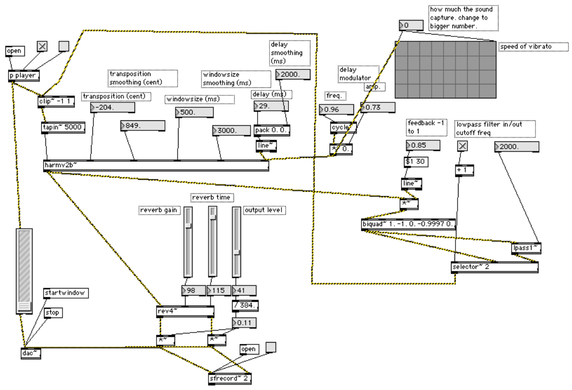


Figure 7: harmv2b~ on the Max/Msp patch

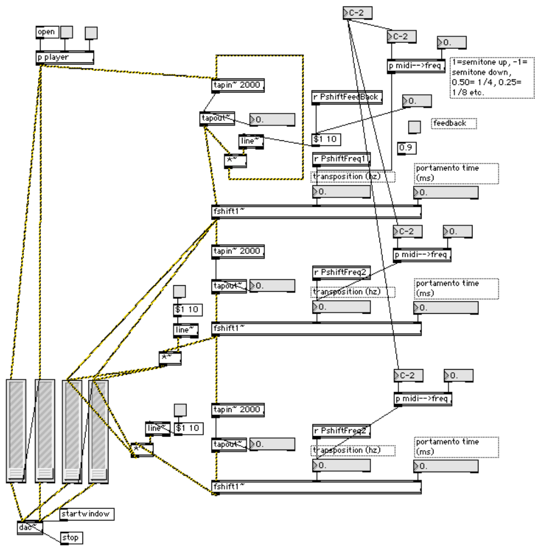


Figure 8: fshift1~ on the Max/Msp patch

Processed sounds on Audio Sculpt and Max/Msp are selected and mixed on Protools to become the final fifteen soundfiles.

REAL-TIME VISUAL IMAGE

The concept of the image is to visualize invisible phenomena like sounds. A visual image will be transformed in terms of a performance each time (Figure 9). The sound of the flute is used to create a real-time visual image during a concert. Because of my experience working on Miyuki Ito's *The Sands of Time* for bass flute to create a live visual image and remix version, I have a good conception of her flute writing. Different kinds of extended techniques such as multiphonics, distinct types of breathing sounds, sweep of harmonics, tongue click, use of flutist's voice create mysterious textures on a visual image as well as on music.

Figure 9: Real-time visual image

1. Hardware System
A microphone picks up flute sounds during a performance. Max/Jitter samples this captured sounds into a computer in terms of amplitude and then converts a value of amplitude to a wave shape. A result of these data draws a wave shape on the screen.

2. Programming
This program is based on elemental geometry.

1) How to describe a wave shape.

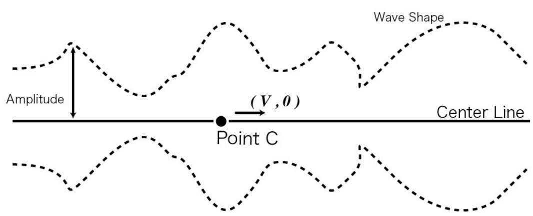


Figure 10

Point C in Figure 10 is moving along the centerline at velocity V and this location is described as

$$\textit{Point C} : (Xc(t) , Yc(t))$$

$$\vec{v} = (V , 0)$$

$$\begin{bmatrix} Xc\ (t+\Delta t) \\ Yc \end{bmatrix} = \begin{bmatrix} Xc(t)+\Delta t \cdot V \\ 0 \end{bmatrix}.$$

2) Rotation direction of center point.
Direction of Point C is controlled in real-time by rotary controller, shown in Figure 11.

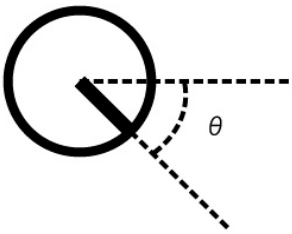


Figure 11: Rotary Controller

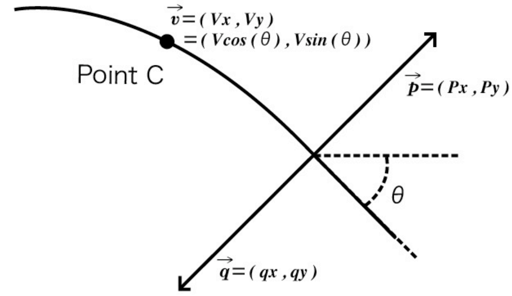


Figure 12

Velocity vector of Point C in Figure 12 is written as
v =(v cos (θ), v sin (θ)).

Center point is written as

$$\begin{bmatrix} Xc\ (t+\Delta t) \\ Yc\ (t+\Delta t) \end{bmatrix} = \begin{bmatrix} Xc(t)+\Delta t \cdot Vcos\ (\theta) \\ Yc(t)+\Delta t \cdot Vsin\ (\theta) \end{bmatrix}$$

and is referred to Figure 14.

Orthogonal vector p to velocity vector in Figure 12 is written as

$$\begin{bmatrix} \vec{p}x \\ \vec{p}y \end{bmatrix} = \begin{bmatrix} \cos(90)Vx + \sin(90)Vy \\ -\sin(90)Vx + \cos(90)Vy \end{bmatrix}$$

$$\begin{bmatrix} \vec{p}x \\ \vec{p}y \end{bmatrix} = \begin{bmatrix} \cos(90)V\cdot\cos(\theta) + \sin(90)V\cdot\sin(\theta) \\ -\sin(90)V\cdot\cos(\theta) + \cos(90)V\cdot\sin(\theta) \end{bmatrix}$$

$$\begin{bmatrix} \vec{p}x \\ \vec{p}y \end{bmatrix} = \begin{bmatrix} V\sin(\theta) \\ -V\cos(\theta) \end{bmatrix}$$

$$\vec{p} = (V\sin(\theta), -V\cos(\theta))$$

and is referred to Figure 15.

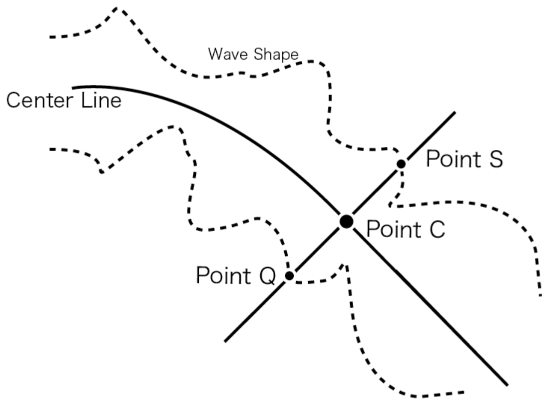


Figure 13

“A” denotes amplitude of sound. Point S on a wave shape shown in Figure 13 is calculated as

Point S : (Xs (t) , Ys (t))

$$\begin{bmatrix} Xs(t) \\ Ys(t) \end{bmatrix} = \begin{bmatrix} Xc(t) + AV\sin(\theta) \\ Yc(t) - AV\cos(\theta) \end{bmatrix}$$

.

Similarly, vector q is written by the following formula.

$$\begin{bmatrix} \vec{q}x \\ \vec{q}y \end{bmatrix} = \begin{bmatrix} \cos(270)V\cdot\cos(\theta) + \sin(270)V\cdot\sin(\theta) \\ -\sin(270)V\cdot\cos(\theta) + \cos(270)V\cdot\sin(\theta) \end{bmatrix}$$

$$\begin{bmatrix} \vec{q}x \\ \vec{q}y \end{bmatrix} = \begin{bmatrix} -V\cdot\sin(\theta) \\ V\cdot\cos(\theta) \end{bmatrix}$$

Point Q is written as

Point Q : (Xq (t) , Yq(t))

$$\begin{bmatrix} Xq(t) \\ Yq(t) \end{bmatrix} = \begin{bmatrix} Xc(t) - AV\sin(\theta) \\ Yc(t) + AV\cos(\theta) \end{bmatrix}$$

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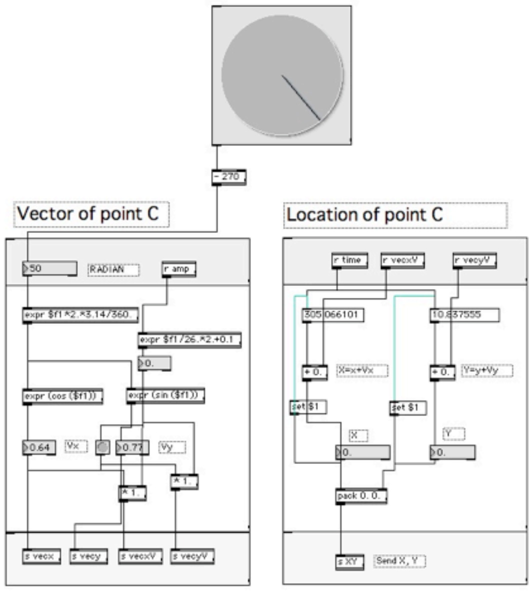

Figure 14: Center Point on the Max/Jitter patch

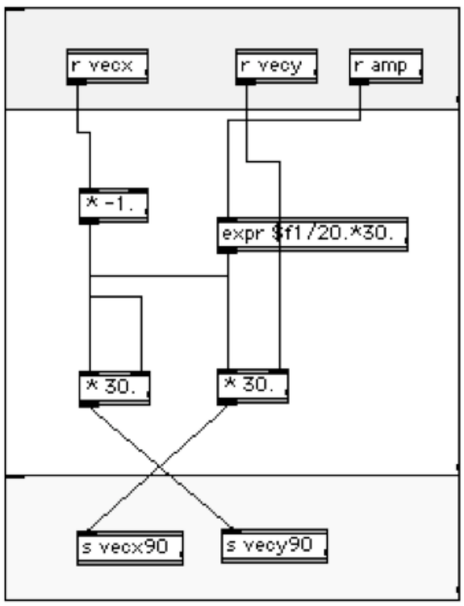

Figure 15: Orthogonal Vector on the Max/Jitter patch

Therefore, the following images were created during the concert, shown in Figure 16.1, 16.2, 16.3, 16.4 and 16.5.

Figure 16.1

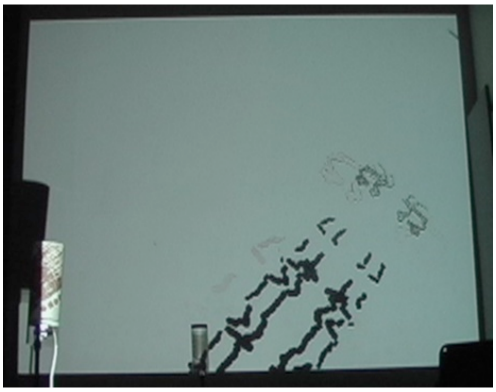

Figure 16.2

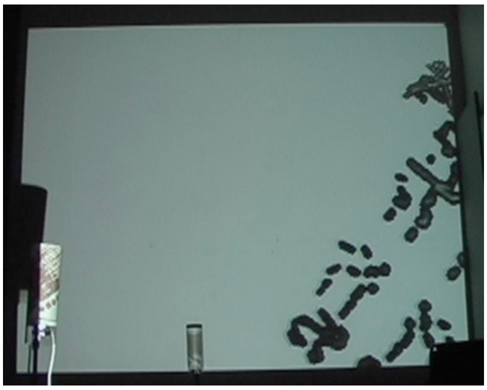

Figure 16.3

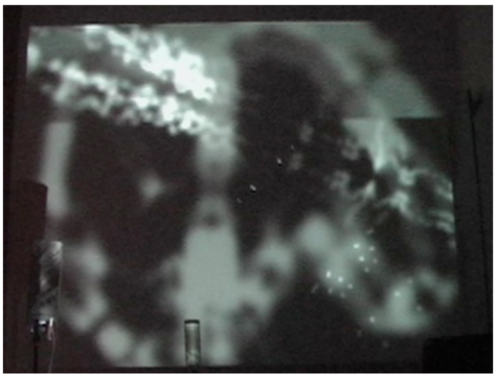

Figure 16.4

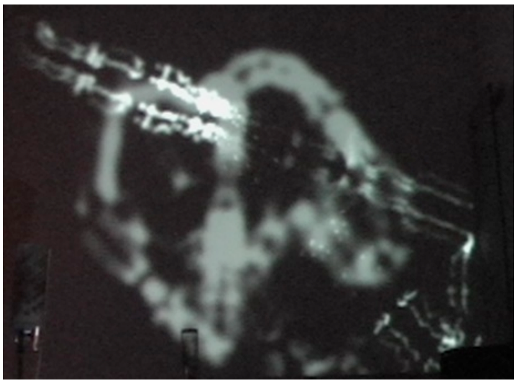

Figure 16.5

Figure 16: Excerpts from the live visual images in the concert.

CONCLUSIONS

Our recent interest is to imagine “invisible things”, which might be a pivotal energy of our creativity. In addition, Japanese sensibility and aesthetics are always present in our works, consciously and unconsciously woven into its very fabric.

Because of the technical limitation of the performance venue for the premier concert in Mexico, it was risky to use live electronics with Max/Msp, as well as to use multiple microphones for each instrument in order to create complicated visual images. However, it will be possible to have more diversity of spatialized sounds with live electronics version and multilayered complex live visual images for a future concert.

Computer technology could enhance our creativity and let us think of new possibilities. Therefore we try to explore a comprehensive approach and in order to give an advanced technology a new meaning. Furthermore, we believe that the most important thing is “invisible phenomena”, which the computer cannot calculate but human being can feel. The invisible we incarnate can generate multidimensional images, using the computer technology.

ACKNOWLEDGEMENTS

Thanks to the Onix Ensamble, the CMMAS and the Japan Foundation, we could have an opportunity to create a challenging work.