UNTOUCHABLE PERFORMANCE AND TECHNOLOGY

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ABSTRACT

This is a report on a composition-performance project with a new musical instrument in which the main concept is "untouchable". As a composer of computer music, designing-developing novel instruments/interfaces is a part of my composition. I will report on not only the system design but also on the performances as applications. This new musical instrument was constructed with infrared ray distance sensors and optical distance sensors with the idea of a "multi-channel Theremin". At first, I developed an instrument "Peller-Min" as a 32-channel Theremin. As an application of this instrument, I composed a new work, "controllable untouchableness" and performed it twice in concerts. Secondly, I developed a compact interface by the same concept. As an application of this interface, I composed a new work "Ural Power" and performed it in Russia and Norway. With these case studies, I will discuss the relationship between "art+science", "music+technology" and "design+performance" in the field of computer music.

1. INTRODUCTION

As a composer/researcher, I have developed many original musical instruments/interfaces. Developing new instrument/interface is one part of my composition [1]. Because I was interested in "real (physical) control", many of my instruments were constructed with bending/force/acceleration sensors. Many optical (light beam) sensors were also used in order to detect the speed of performance. This paper is a report of a new musical instrument/interface in which the main concept is "untouchable". Of course, this concept is very famous [2], but I will report on not only the system design but also on the performances as applications.

2. WHAT IS COMPUTER MUSIC ?

With case studies in my project, I will discuss the relationship between "art and science", "music and technology" and "design and performance" in the field of computer music. Some people - in “the contemporary” or “classic” or “fine art” music field - seem to hate or avoid, or are not concerned with computer music. I think the situation is not happy for those people in their musical life, because they miss the chance/possibility to expand their creativity. This report aims at dispelling this misunderstanding around media-arts, performance with technology, and computer music.

2.1. “art” vs “science”

From the Greek era, "art" embodies the physical and mathematical mystery of the universe (Figure 1). Music theory is also based on the orderly mathematical system. Since the computer algorithm describes and realizes the physical and mathematical rules, it is a self-contradiction that music people avoid computer music. Thus, "art" and "science" are not opposed to each other, but essentially in harmony.

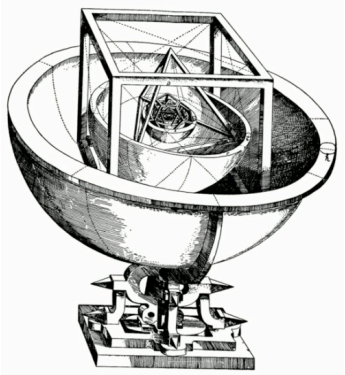

Figure 1. Kepler's Solar-Music System.

2.2. “music” vs “technology”

Some people concerned with classical music tend to evade electronics and computer technology. However, we should remember that acoustic instruments formed classical music, and they were remarkably improved with innovation by craftsman's technology, and the "possibilities of music" have been expanded by novel musical instruments. Moreover, people in the world enjoy music, which is recorded and supported just by electronic technology. The student who majors in composition at a college of music composes a symphony supported by the sequence software of PC. Mozart composed some melodies by playing dice, and this algorithm is easily realized by a computer program for music generation. Bartok composed some music with the golden ratio, and this equation of fractal is easily embedded into a computer algorithm. There are many special topics, which can be applied to music in science and technology - chaos, fractal, statistics, fuzzy, chance, bio-related, networked, etc. We cannot escape technology, when concerned with music. Figure 2 shows the "traditional" music model (composer-player-listener) and the "21 century" music model (composer-system-listener).

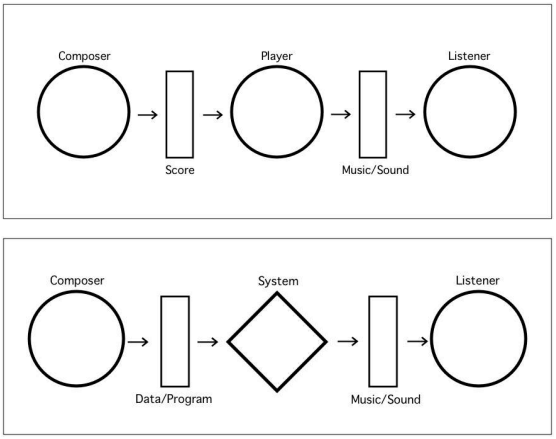

Figure 2. Traditional music / 21 century music.

2.3. "design" vs "performance"

About live music, there are two stages - the stage of beforehand creation (design) and the stage of realization in real time (performance). In traditional music, the "design" process was the "composition", and the "performance" process was separated from the composer. However, in computer music, both the "design" and "performance" stages are the field of the composer. Figure 3 shows the "composer" model (composer-player-listener inside) and the "Player" model (improvise arranger-player-listener).

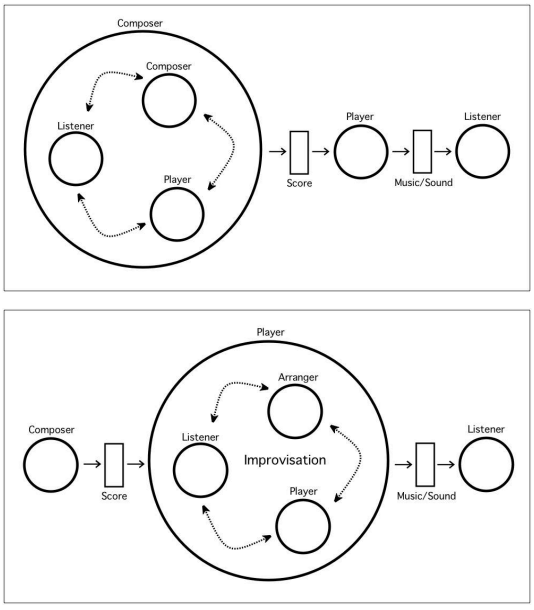

Figure 3. Composer model / Player model.

Considering 21st century music from this model, we can understand the "performing composer" and the "active listener" model. Figure 4 shows the "composer" model (composer-player-listener inside) and the "Player" model (improvise arranger-player-listener). The composer can do everything in music, so we should use many tools to expand the possibility in the composition and the performance. Moreover, I will naturally expand this concept to design and develop special instrument/interface originally. This is the main theme of this paper.

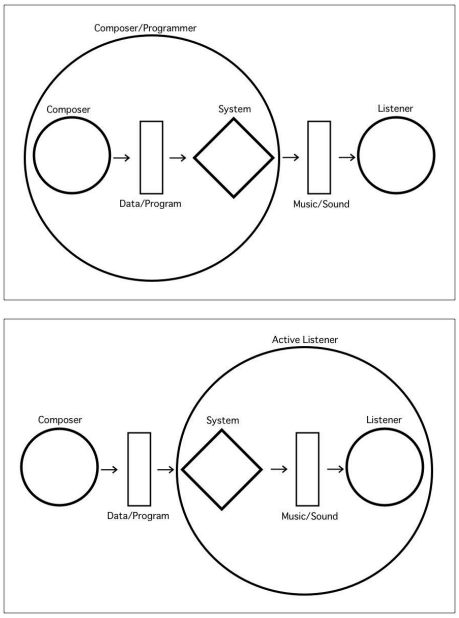

Figure 4. Composer / Active Listener.

3. NEW INSTRUMENT "PELLER-MIN"

Figure 5 shows the new instrument "Peller-Min". This name is based on the powerful processor "propeller" chip [3]. It has double big rings, and there are eight infrared ray distance sensors (SHARP 2Y0A21) on each of them. The 16-channel outputs are captured by two AD-C0809 8-bit A/D converters. Propeller detects this distance information, and transfers them to MIDI output. The advantage of the design with the double ring is the possibility to perform to two sensors or more at the same time with one arm/hand.

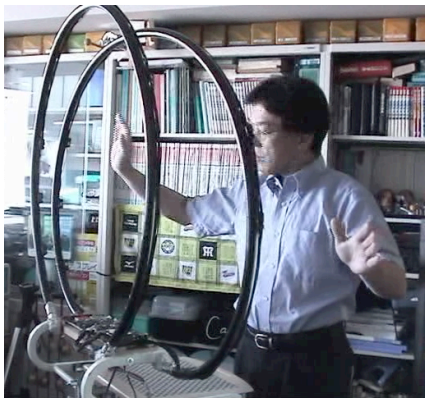

Figure 5. The new instrument "Peller-Min".

Figure 6 shows the close-up of "Peller-Min". In the "table" part of this instrument, there are two blocks of eight LED distance sensors for right/left hands. NJL7502L is a small photo-transistor to replace CdS, and the optical characteristic of this device is similar to a human's. There are 16 pairs of high-luminance blue LED and NJL7502L, and the "kneading" performance can be detected with the reflection by hand. The propeller also detects this reflection information, and transfers it to MIDI output. The Propeller processor has eight parallel-

CPUs inside, and one of them is used as MIDI FIFO interface as a transmitter. There is no special hardware like USART inside the propeller, but each CPU has a speed high enough to manage a 31.25Kbps serial signal by software only, and the MIDI interface runs well.

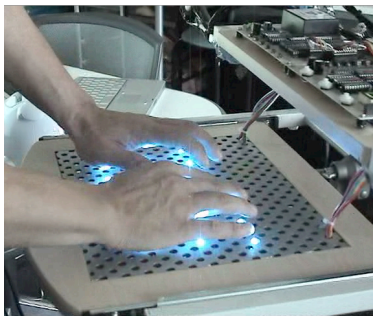

Figure 6. close-up of “Peller-Min”.

4. PERFORMANCES OF "CONTROLLABLE UNTOUCHABLENESS"

4.1. Composition and sound design

For the most part, my composition is the programming in the Max/MSP/jitter environment. This new work "controllable untouchableness" is of course composed in Max5. Basically, all sounds are generated in realtime: noise+filter, sinusoid and FM. There is absolutely no synthesizer, sound modules nor sound files. Because easily-understanding the relationship between performance and sound is the most important point in this composition, all sensor parameters are simply mapped to parameters of sounds (pitch, timbre, etc).

4.2. Performance in December 2009 / September 2010

Live computer music "controllable untouchableness" was composed and premiered in December 2009 at the "InterCollege Computer Music Concert" in Kunitachi College of Music, Tokyo. The audience consisted of specialists/composers of computer music in Japan. The performance of this work received good praise from the large audience. "Controllable untouchableness" was performed again in September 2010 at the concert of "[Make] Ogaki Meeting" in Softopia Japan, Gifu. The audience consisted of artists/engineers in Japan. The performance of this work also received good praise from the large audience. Figure 7 shows the performance.

Figure 7. Performance of “controllable untouchableness”.

5. NEW INTERFACE OF THE SAME CONCEPT

The musical instrument "Peller-Min" is very large. For convenience of the performance travel in Japan, it is designed (1) resolve it to carry, and (2) assemble it in the concert hall. In 2010, I had a chance to premiere my new work in Russia [4], but the instrument "Peller-Min" was too big to bring to Russia. So I started a new project of composition new work and production new interface. The basic concept is the same.

5.1. New interface of compact sensors

Figure 8 shows the new interface (this interface does not have its special name) for the new work "Ural Power". There are also 8-channel infrared ray distance sensors (2Y0A21), but they can be removable. I arranged to borrow 2 microphone stands from the hall, and I assembled these sensors just before the concert. The main CPU AKI-H8 is very popular in Japan.

For this work, I used not only this interface but also my original instrument "MiniBioMuse-III" (Figure 9). This instrument is similar with the concept of Ben Knapp [5]. Because the new interface has only 8-channels, and I want more control parameters. "MiniBioMuse-III" detects 16-channels of EMG information of both arms. Though these two sensors are different in physical detection procedure, the performance for the audience seems very similar. If the performer moves his arms or shakes his fingers in front of the distance sensors, the sounds and graphics will change. If the performer moves his arms or shakes his fingers, these gestures will be detected by the 16-channel EMG sensor and the sounds and graphics will also change.

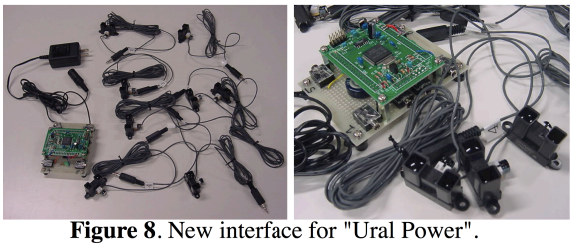

Figure 8. New interface for "Ural Power".

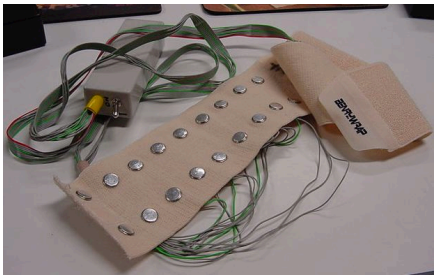

Figure 9. Left part of "MiniBioMuse-III".

5.2. Composition and realtime graphics

The new work "Ural Power" is of course composed in Max/MSP/jitter (Max5) environment. Basically, all sounds are generated in realtime : noise+filter, sinusoid and FM. Because "Peller-Min" has its graphical ap-

peal-points on stage by many blue LEDs, I did not use a graphic part in my composition. However, the interface for "Ural Power" has no visual character, so I designed the realtime 3D-CG generating part in my composition.

I programmed the realtime 3D-graphics by Open-GL in jitter environment, and all parameters were mapped not only into sound generation but also into realtime graphics. In the screen, there are many solid plates - with five layers, and placed in a circle. The viewpoint (camera) is moving slowly within the 3D space. Parameters from the performance are realtime mapped to (1) the radius of each layer, (2) counts of plates of each layer, and (3) color of plates.

5.3. Performance in December 2010

Live computer music "Ural Power" was composed and premiered in December 2010 at the "International Festival/Competition - SYNC.2010 Gala Concert" in the Ural State Conservatory, Yekaterinburg, Russia. The audience consisted of musicians/composers. The performance of this work received good praise from the large audience. Figure 10 shows the performance.

Figure 10. Performance of "Ural Power" in Russia.

5.4. Performance/Report in 2011

Concert submission of "Ural Power" was accepted for NIME (International Conference on New Interface for Musical Expression), and I performed the work again at the NIME2011 live concert in Oslo. The audience included specialists - musicians, composers and researchers. The performance of this work received good praise from the large audience. Figure 11 shows the performance.

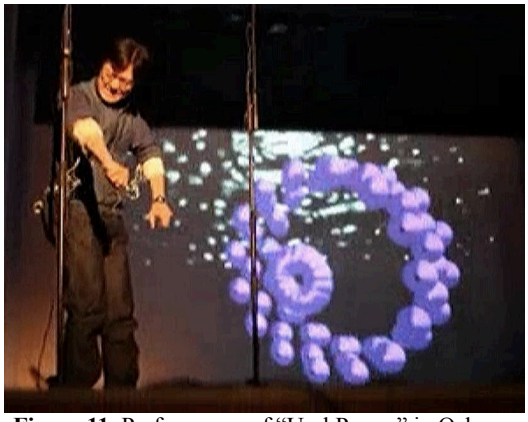

Figure 11. Performance of "Ural Power" in Oslo.

A research presentation submission of this project was also accepted for ICMC (International Computer Music Conference), and I had a poster presentation with a video demo at the ICMC2011 in Huddersfield, UK.

6. CONCLUSIONS

I have reported my projects and discussed about computer music. I will continue to try to compose other possibilities in human performance.

7. REFERENCES

[1] http://nagasm.org/ASL/profile/

[2] J. Paradiso, American Innovations in Electronic Musical Instruments - Noncontact Gesture Sensing and Responsive Environments, NewMusicBox, 1999.

[3] http://nagasm.org/ASL/propeller/

[4] http://nagasm.org/1106/SYNC2010/

[5] Ben Knapp, BioControl Systems, http://www.biocontrol.com/services.html

8. Author Profile

Yoichi Nagashima, composer/researcher/PE, was born in 1958 in Japan. From 1991, He has been the director of "Art & Science Laboratory" in Japan Hamamatsu, produces many interactive tools of real-time music performance with sensors, cooperates some researchers and composers, and composes experimental pieces. He is also a key-member of the Japanese computer music community. Currently, he is a professor at SUAC (Shizuoka University of Art and Culture), Faculty of Design, Department of Art and Science, and teaches multi-media, computer music and media-arts. He organized and was the General Chair of NIME04.