UNTOUCHABLE INSTRUMENTS AND PERFORMANCES

Yoichi Nagashima
Shizuoka University of
Art and Culture
2-1-1, Chuo, Naka-ku,
Hamamatsu, Shizuoka JAPAN

ABSTRACT

This paper is a report of new musical instrument/ interface in which the main concept is "untouchable". I will report on not only the system design but also on the performances as applications. The new musical instrument/interface is constructed with infrared rays distance sensors and optical distance sensors. In attending some concerts of computer music in the past, I was inspired with performances by hand-gesture, and the idea of "multi-channel Theremin" struck me. At first, I developed a new instrument "Peller-Min" as the 32-channels Theremin. As the application of this instrument, I composed new work "controllable untouchableness" and performed twice in concerts. Secondly, I developed a new compact interface by the same concept. As the application of this interface, I composed new work "Ural Power" and performed in Russia.

1. INTRODUCTION

As a composer/researcher, I have developed many original musical instruments/interfaces. To develop 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 performances. This paper is a report of new musical instrument/interface in which the main concept is "untouchable". Of course this concept is very famous [2][3], but I will report on not only the system design but also on the performances as applications.

2. NEW INSTRUMENT "PELLER-MIN"

Figure 1. shows the new instrument "Peller-Min". It has double big rings, and there are eight infrared rays distance sensors on each of them. The infrared ray distance sensor is very popular, SHARP 2Y0A21. The 16-channels output are captured by two ADC0809 8-bits A/D converters. The Propeller processor accesses each A/D converters, detects these distance information, and finally 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 by one arm/hand.

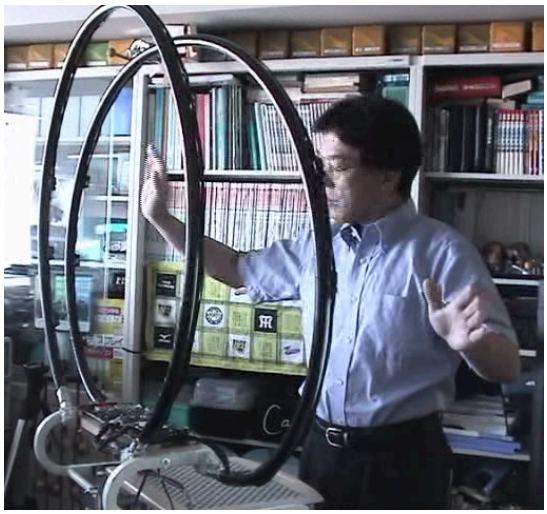


Figure 1. The new instrument "Peller-Min".

Figure 2. shows the close-up of "Peller-Min". In the "table" part of this instrument, there are two block of eight LED distance sensors for right/left hands. This LED distance sensor is my original, with a pair of a blue LED and a special sensor. NJL7502L is very small photo-transistor to replace CdS. The optical characteristics of this device is similar to human optical characteristics. There are 16 pairs of high luminance blue LED and NJL7502L, and the "kneading" performance can be detected with the reflection by hand. The 16 channels output are also captured by two ADC0809. Propeller processor also detects these reflection information, and finally transfers them to MIDI output.

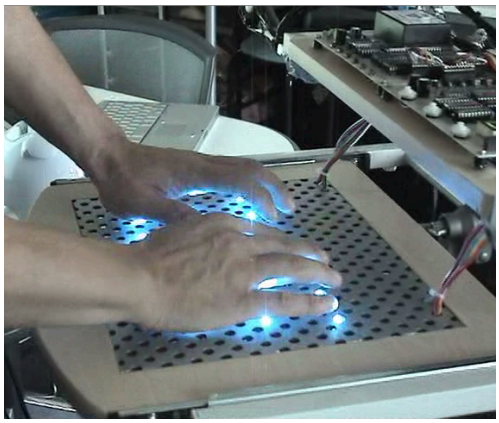


Figure 2. Close-up of “Peller-Min”.

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 Propeller, but each CPU is high-speed enough to manage 31.25Kbps serial signal by only software, and MIDI interface runs very well.

3. PERFORMANCES OF "CONTROLLABLE UNTOUCHABLENESS"

3.1. Composition and sound design

Almost my composition is the programming in Max/MSP/jitter environment. This new work "controllable untouchableness" is of course composed in Max/MSP. Basically, all sounds are generated in realtime - noise +filter, sinusoid and FM. There are completely neither synthesizer, sound modules nor sound files. Because easily-understanding the relationship between performance and sound is most important point in this composition, all sensor parameters are simply mapped to sound parameters.

3.2. Performance in December 2009

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 audiences were the specialists/composers of computer music in Japan. The performance of this work received good praise from the large audience.

3.3. Performance in September 2010

"Controllable untouchableness" was performed again in September 2010 at the concert of "[Make] Ogaki Meeting" in Softopia Japan, Gifu. The audiences were the artists/engineers in Japan. The performance of this work received good praise from the large audience, too. Figure 3. shows the performance.

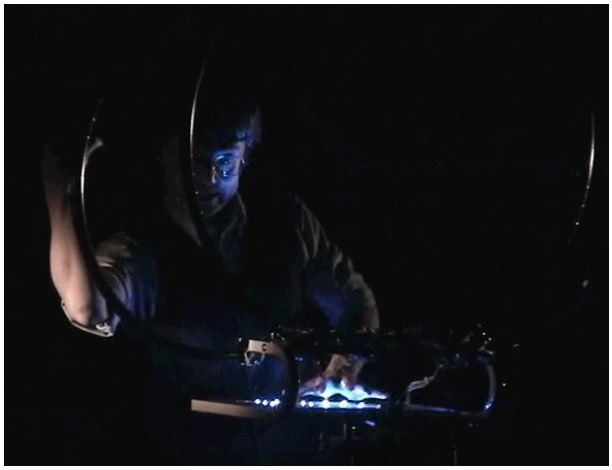


Figure 3. Performance of “controllable untouchableness”.

4. 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. Figure 4. shows the mechanism.

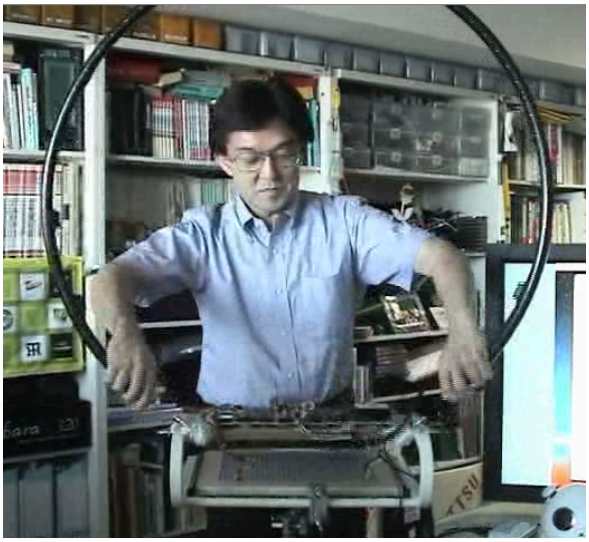


Figure 4. Removable Rings of “Peller-Min”.

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. Basic concept is the same.

4.1. New interface of compact sensors

Figure 5. shows the new interface (this interface does not have its name) for the new work "Ural Power". There are 8-channel infrared ray distance sensors (SHARP), but they can be separated. I ordered that I would borrow 2 microphone stands of the hall, and I assembled these sensors just before the concert. The main processor is AKI-H8 which is very popular in Akihabara, Japan.

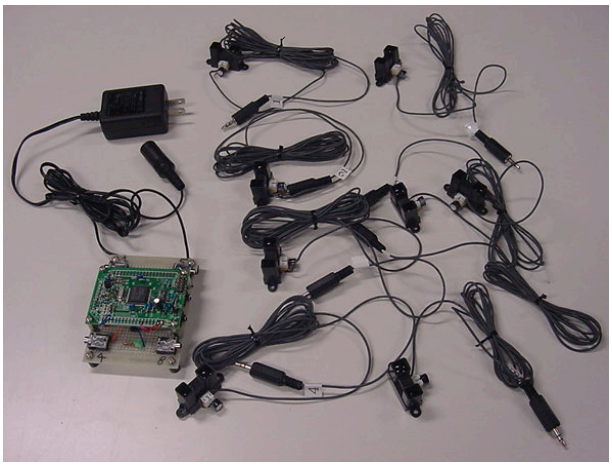


Figure 5a. New interface for "Ural Power".

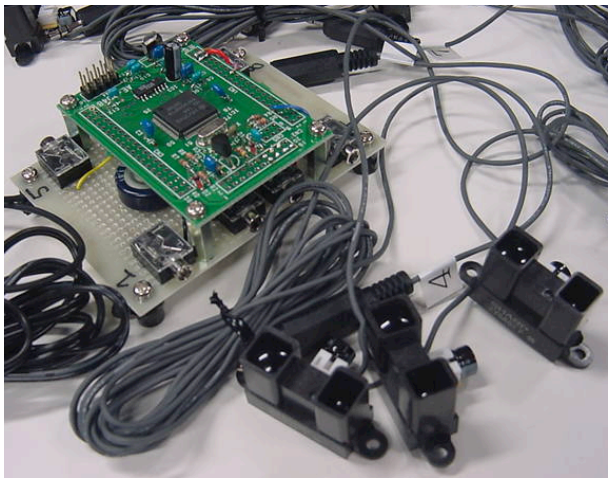


Figure 5b. New interface for "Ural Power".

For this work, I used not only this interface but also my original instrument "MiniBioMuse-III" (Figure 6) [5]. This instrument is similar with the concept of Ben Knapp [6]. 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 performer moves his arms or shakes his fingers in front of the distance sensors, then sounds and graphics will change. If performer moves his arms or shakes his fingers, these gestures will be detected by the 16-channels EMG sensor and sounds and graphics will also change.

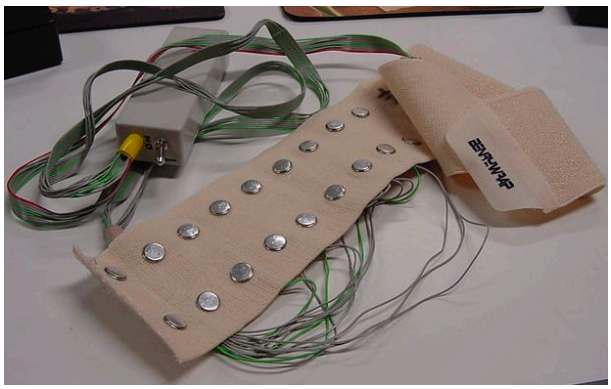


Figure 6. Left part of "MiniBioMuse-III".

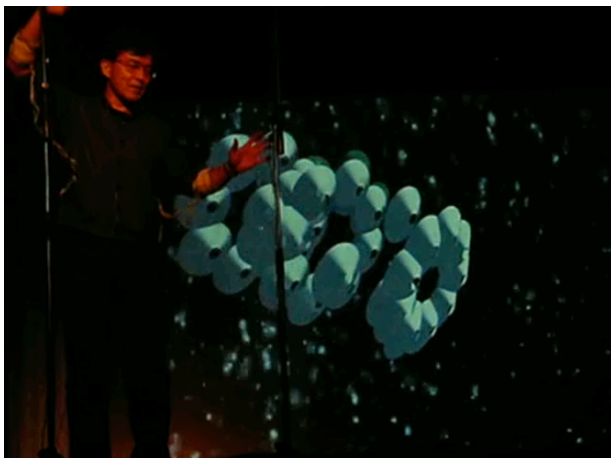
4.2. Composition and realtime graphics

The new work "Ural Power" is of course composed in Max/MSP/jitter environment. Basically, all sounds are generated in realtime - noise+filter, sinusoid and FM. Because "Peller-Min" has its graphical appeal-points on stage by many blue LEDs, I did not use graphic part in my composition. But the interface for "Ural Power" has no graphic parts, so I designed realtime graphical part in my composition.

I programmed 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 5 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.

4.3. 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 audiences were the musicians/composers. The performance of this work received good praise from the large audience. Figure 7. shows the performance.



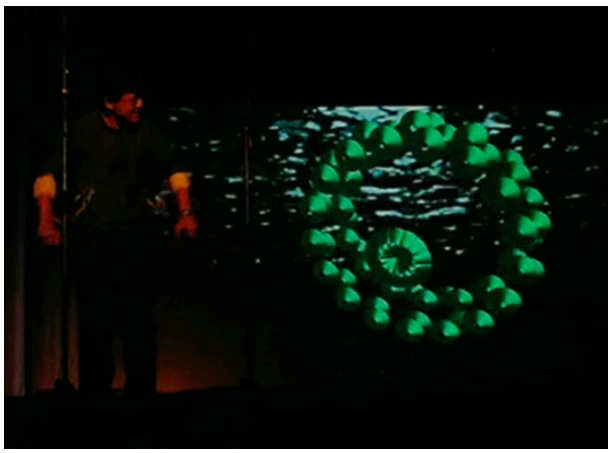


Figure 7a. Performance of “Ural Power”.

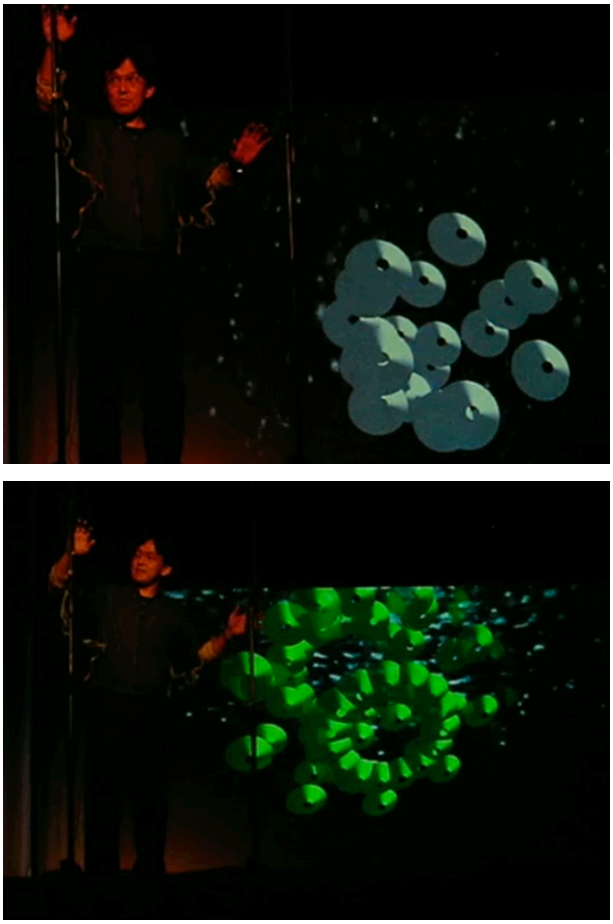


Figure 7b. Performance of “Ural Power”.

5. CONCLUSIONS

This report is about new instrument/interface of my composition. I will try to compose other possibility in human performance.

6. REFERENCES

[1] http://nagasm.suac.net/ASL/profile/

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

[3] J. Paradiso, Electronic Music Interfaces, http://web.media.mit.edu/~joep/SpectrumWeb/SpectrumX.html

[4] http://1106.suac.net/SYNC2010/

[5] http://nagasm.suac.net/ASL/SYNC2010_Lecture_3/

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