GHI project and "Cyber Kendang"

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ABSTRACT

This is a report of research project about developing novel musical instruments for interactive computer music. The project's name - "GHI project" means that "It might be good that musical instrument shines, isn't it?" in Japanese. I examined the essences of musical instruments again on proverb "Taking a lesson from the past". At the first step, my project targeted and chose "Kendang" - the traditional musical instrument of Indonesia.

Keywords

New Instruments, Sound and Light, Media Arts, Kendang

1. BACKGROUND

Up to now, I have developed new musical instruments by the approach of installing the sensors in a lot of kinds of traditional musical instruments [1-7]. Figure 1 was called "Hyper-Pipa", which was an Chinese traditional instrument arranged with 3-D acceleration sensors, gyro sensor and vibration sensor. Figure 2 was specially produced sensor for SHO which is the Japanese traditional instrument. Besides this, a lot of reports of developing new musical instruments are reported with ICMC and NIME, etc [8-20]. In the history of traditional musical instruments, we can find proven individuality and senses of existence. In working with this field, I found the different interests in the development of musical instruments by modern materials. However, there is a serious problem in the approach of installing the sensor into traditional musical instruments. There is a possibility of changing the condition of the sound because natural musical instrument generates the sound by the film/string vibration and the resonance vibration even if it is a very small hole installing the sensor. There is also an acoustic problem when bonding to install the sensor and the electric circuit.

2. GHI PROJECT

As the start point, I selected three policies with looking straight the essences of musical instruments as a new approach. (1) Musical instruments is a tool of music, and it is good partner for musical expression in the performance. (2) As for natural musical instruments, the sound is radiated, and not only the audience but also the player receives the sound from the whole in the space. (3) Player's expression mesmerizes an audience from not only the aural route but also the visual route. The idea of a new project arose here. The project's name - "GHI project" means that "It might be good that musical instrument shines, isn't it?" in Japanese. I added the function "visual information generator" to the traditional musical instrument as shown in this name, and decided not to install sensors at all.

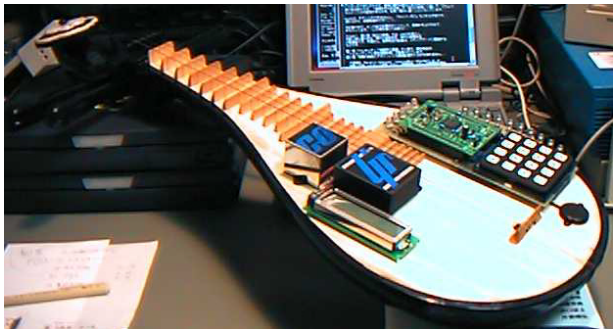

Figure 1: Hyper-Pipa

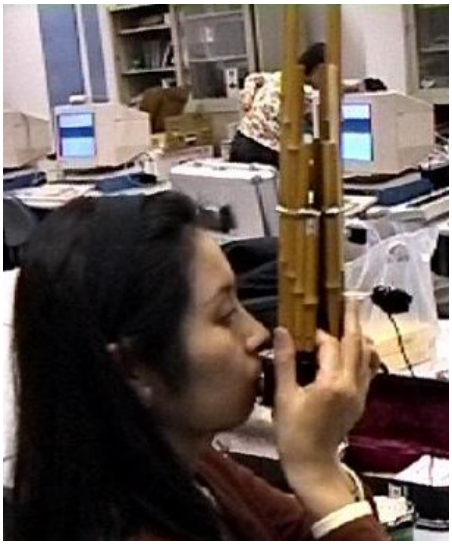

Figure 2: SHO sensor

The progress of recent image processing technology is also important as the background in which the sensor is not physically installed into musical instruments. When the musical instrument shines as an expression of the music performance, CCD/Video camera can detect the image by

noncontact. The same result as past MIDI sensors can be achieved by the real-time image processing (Max/MSP/jitter). It can be said that the possibility of the expression of the media art will expand from the standpoint of the music aesthetics by this approach. The policy of not physically installing the sensor excludes the possibility that the hole and the adhesive damage the sound characteristics of the traditional musical instruments.

3. TARGET : KENDANG

I chose a drum called "Kendang" as the first target. Kendang (Javanese: Kendhang) is the primary drum used in gamelan music. It usually is placed on stands horizontally and hit with both sides. One side is generally larger than the other, but I used the same-size type. The skin is typically made of goat or buffalo, stretched on y-shaped leather or rattan strings, which can be tightened to change the pitch of the heads. In archaic gamelan ensembles, the Kendang was hit with a stick, but I played with my hands. I performed the multimedia music with having this instruments from the neck by using the strap. Figure 3 shows the arranged musical instrument "Cyber Kendang".

Figure 3: "Cyber Kendang"

Figure 4 shows the front of "Cyber Kendang". When I met this Kendang for the first time, I was inspired by the pattern of the skink at the center of the front. So, I made the pattern of this skink a leading part in the stage of the design. This instrument have 5 blocks (total 304) of LEDs. Eight lines in the center part are composed of high luminance blue LEDs, and they shine corresponding to the power by which Kendang is beaten. High luminance white LEDs of the remained four blocks(240) continue displaying automatically the geometrical patterns. And the brightness changes corresponding to power by which Kendang is beaten.

Figure 4: The front of "Cyber Kendang"

4. SYSTEM

An important point in the development step was "not to make any holes and not to bond anything to the musical instrument". As the result, I could return it to former musical instrument by always detaching the system. PCB(printed circuit board), used with general electric circuits, was not able to be used for this condition. I combined the wires plated with tin like the mesh, and made this the frame equipped with the electric circuits. All of the 320 high luminance LEDs were soldered directly onto this meshed frame. I connected the frame to the string that pulled the skin of Kendang with the wire. With this method, the hole and the adhesive are unnecessary, and detaching is easy. 40 LED driver/latch ICs(74HC574) were stacked by each other for high density assembly. Figure 5 shows the electronic circuits block of "Cyber Kendang".

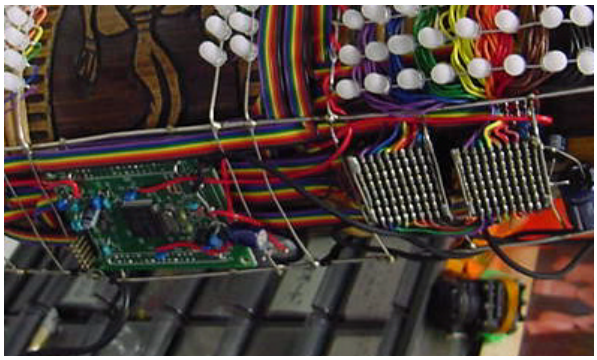

Figure 5: Electronic Circuits of "Cyber Kendang"

The system was constructed with AKI-H8 (CPU: Toshiba 32bits, 8ch 8bits A/D, USART, I/O ports) . The electret capacitor microphone was attached on the part on the edge of Kendang with the double-faced tape. This tape can be easily peeled off in the weak force. The sound of Kendang was detected by this microphone, and processed with the software of AKI-H8 as a parameter of the change in the brightness of LEDs. I dared not to adopt though it was technically easy to

output this information as MIDI.
A big problem remained about Power Supply. Finally I decided to connect a small power supply unit and dragged it. Because the important feature of this system was the expression by 320 LEDs, and when they lit at the same time, the supply of +5V 5A or more was necessary.

5. PERFORMANCE

As a Computer Music researcher, developing new musical instruments is one part of my composition. I composed a new work featuring the "Cyber Kendang", and performed the work at "Media Art Festival 2006" in SUAC. Title of the new work was "Cyber Kendang". The key concept was not to play the musical instrument according to the computer, but to drive the entire acoustics and graphics by playing musical instrument (sound and light). I composed the whole of the work with Max/MSP/jitter environment. The image of the performer on stage was captured with video camera, and was processed by jitter in real time. This live image became an important element of the graphics part projected from the projectors with pre-produced movies.

Figure 6: Dual 3-D acceleration sensor

At first, I planned - the result of image processing would trigger and control all parameters in music. However, I changed this plan because of the latency of image processing of jitter. I prepared additional sensor, called "Dual-3D acceleration sensor" which send MIDI information of [x, y, z] acceleration data of both hands.
In the performance of "Cyber Kendang", live image was projected to three screens. The appearance of the luminescence of this instrument was captured with video camera and was processed and superimposed in real time. Moreover, the brightness information was used for slow-changing parameters in music. Figure 7 shows the performance of "Cyber Kendang" (23th December 2006) in the Media Art Festival 2006. This work was accepted for NIME07 (New York), and it was scheduled for performance session (concert).

6. DISCUSSION

This time, I reported only in the first step of the GHI project. A lot of musical instruments brought up and exist in each region and the tradition all over the world. I can say that these musical instruments in the world are new objects of development and the research from the aspect of the GHI project.
I examined types of musical instruments of a suitable object for the GHI project. Musical instruments with continuous sound like the violin are not so suitable. Musical instruments with percussive sound like drum and guitar are suitable. The visual sensitivity to time-variant information is very low compared with the aural sensitivity of human. I think it would better to generate "long-decay effect" part in music.

7. CONCLUSIONS

I reported the "GHI project" about developing novel musical instruments for interactive computer music. At the first step, my project targeted and chose "Kendang" - the traditional musical instrument of Indonesia. I also reported about the composition and the performance featureing this instrument. I want to advance this research for new traditional musical instruments to develop the possibility of new Computer Music continuously in the future.

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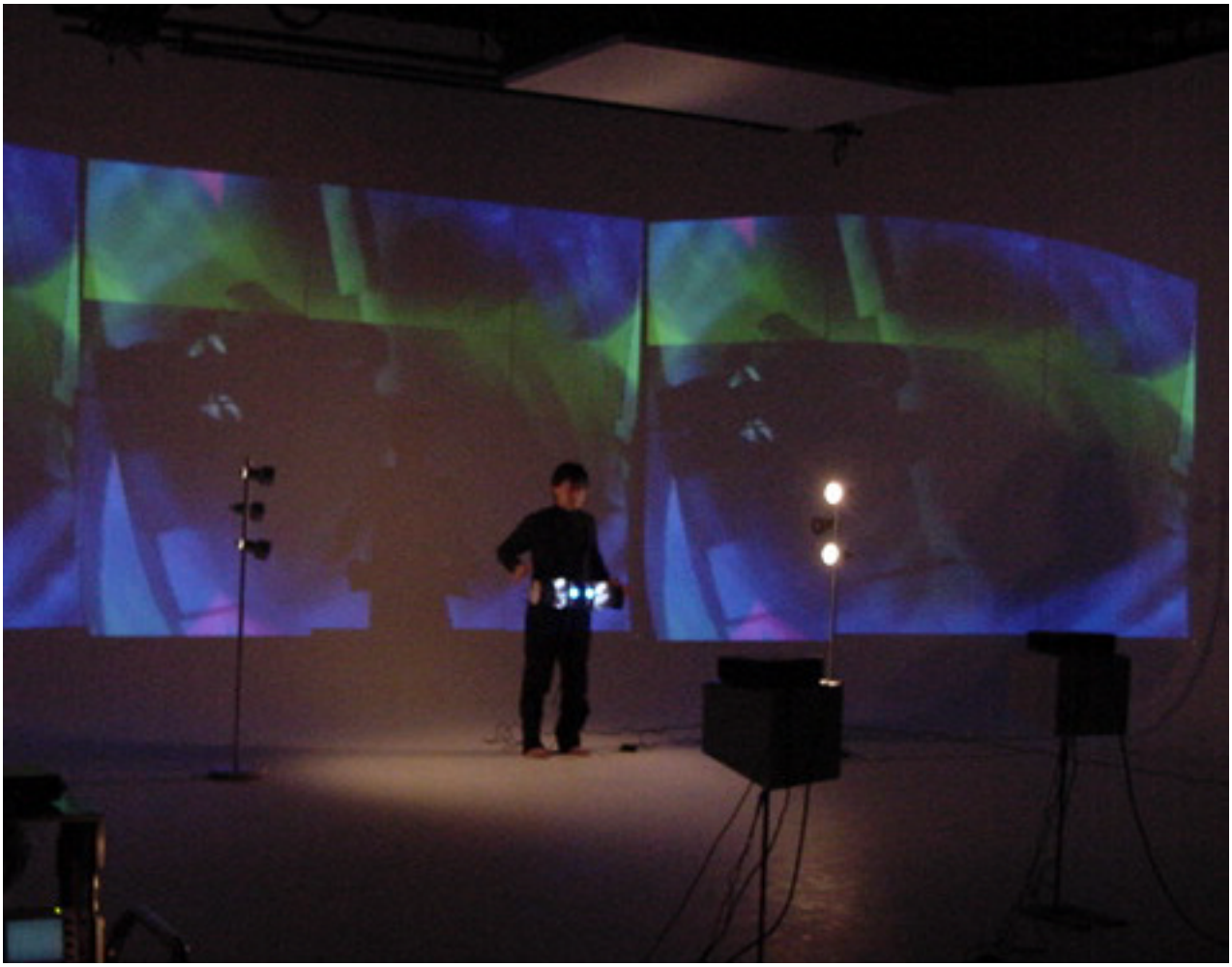

Figure 7: Performance of "Cyber Kendang"