Hands On Stage: A Sound and Image Performance Interface

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Abstract

Hands On Stage, designed from a percussionist's perspective, is a new performance interface designed for audiovisual improvisation. It comprises a custom-built table interface and a performance system programmed in two environments, *SuperCollider 3* and *Isadora*. This paper traces the interface's evolution over matters of relevant technology, concept, construction, system design, and its creative outcomes.

Keywords: audiovisual, interface design, performance.

1. Introduction

Hands On Stage is a new table interface intended for audiovisual performance. Through converging aspects from the field of contemporary percussion performance and Media Art, a new performance approach was explored. The Hands On Stage project is an exploration between performer's movements and sounds, as well as between sounds and visuals. This paper is based on an earlier draft [1] presented at the Australasian Computer Music Conference (ACMC) held in Sydney in 2008.

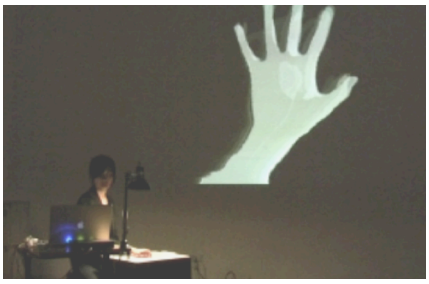

Figure 1. Real-time captured images projected on the screen behind the performer.

While there are a range of table interfaces designed for musical interaction including the reacTable [2], Morphing Table [3], and the touch table of Sound Rose installation [4], the Hands On Stage interface is different in terms of the system design and interface function as it is designed as a solo performance instrument. Instead of projecting visuals onto the table surface to provide feedback for the user/performer, Hands On Stage is designed to project visual elements onto a screen for the audience to view. This gives the audience a third element to focus on besides performer's movements and sound produced (Figure 1).

2. Precedence and Concept

Before actual construction of the physical interface, preliminary research included acquiring fundamental knowledge of programming, as well as searching for relevant hardware materials and software technologies to facilitate the communication.

The first step was seeking a method to convert the performer's physical movement into digital data. Two distinctive approaches, sensor-based technology and object-tracking method, were considered. Due to time limitation, object-tracking method was employed, as it was easier to implement. The second step was to sketch an idea for the physical interface structural design with one specific condition. That was the interface must function as a platform for the exploration of convergent aspects of Media Art and Percussion performance. I began to review the percussion repertoire that I have performed, and the idea of utilizing a table as the interface came to mind as I remembered performing Thierry De Mey's composition, *Musique de Tables*. This piece is composed for three percussionists who produce sounds by striking a table with their hands. Hands On Stage could be seen as an extension of De Mey's piece.

3. Physical Interface Construction

Hands On Stage is a plywood structure with a Perspex performance surface. The tabletop performance surface is covered with a sheet of drafting film for light diffusion. Two contact microphones are placed diagonally opposite each other underneath the performance surface, and are connected to a recording interface. A web camera is placed underneath the performance surface. Early experiments have exposed a problem of FireWire conflict in audio setting when using an *iSight,* a FireWire web camera with built-in microphone. One solution to this issue was to replace the *iSight* with a USB web camera. However, it was soon realized that more control over the operation of this interface was necessary. One quick and inexpensive solution was to incorporate the use of a commercially

available product, the Nintendo's *Wii Remote* (*Wiimote*) controller. *Wiimote's* main function here is to act as gates that allow or block the data communication between the two programming environments.

4. Performance System

The performance system was approached and constructed as three stages: input control data, control data analyses, and mapping analysed data to sound and image processing. The system design was configured in two programming environments, *Isadora* [5] and *SuperCollider 3 (SC3)* [6].

Audio processing and amplitude analysis are handled in *SC3*. For a responsive microphone amplitude analysis, the current setup for detection is running 120 times per second, and it only costs around 1% of CPU usage as shown on *SC3* server. The control data of *Wiimote* are also managed in *SC3*. The *Wiimote* button activation sends Bluetooth Human Interface Devices (Bluetooth HID) data to the computer. With the *Wiimote* implementation developed by Pete Moss [7], the control data are received and processed in *SC3*.

The image effects and object tracking analysis are done in *Isadora*. The attached web camera captures the shadow produced on the performance surface. With the use of *Threshold* module for color reversing, and the *Eyes* module for tracking analysis, the control data are obtained. The *Eyes* module analyzes the brightness and the position (X and Y) of the shadowgraph and converts these values into numerical data. These data are mapped to various sound parameters in *SC3* via an *OSC Transmit* module. To reduce additional latency in real-time video processing, the input of video resolution and the projected screen size were scaled down to 320 x 240 pixels. However, with a more advanced computer and video card its video resolution could be adjusted to higher quantities. Figure 3 illustrates the inter-relationship between performer, sound and image. The numbers in this figure indicates the order of events.

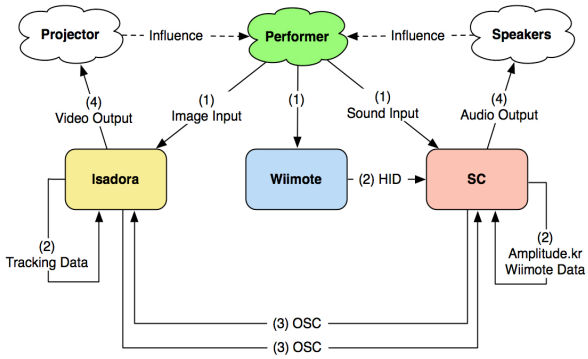

Figure 3. Diagram of the inter-relationship between performer, sound and image.

5. Hands On Stage - Untitled #1

Hands On Stage - Untitled #1 is structured sound and image improvisation with composed interaction. This improvisation begins with producing sounds by striking the performance surface with various parts the performer's hands (finger tips, nails, fist and palm) and undefined objects in any way. In one performance, I produced sounds by writing with a pencil. In addition to this novel sound production technique, the performance also brought a different theatrical appearance. These sounds are recorded and used as segments for the next section in creating rhythmic patterns. Once the pattern is created, a melodic line is introduced. Here, the rhythmic pattern serves as the accompaniment for the melodic line, in which the pitch is determined by the hand's position via tracking analysis. Finally, the improvisation ends with white noise based sounds, in which the amplitude data is mapped to the intensity of the noise sounds.

6. Conclusion and Future Work

This paper has outlined the development of the Hands On Stage project. This project achieved the desired outcome in its technology functionality. In addition, a defined media space configured for the Hands On Stage performance has maximized the audience engagement, as the convergence of the sonic and visual elements has supported further accessibility for the audience to appreciate experimental practices. Possibilities for future development of the research include reworking the project for new contexts, such as an ensemble setting and a gallery installation. Also, different materials for the performance surface such as drum skins and glasses can be considered. Moreover, the performance system has much potential for further improvement towards comprehensive data analysis.

There is video documentation of Hands On Stage available on YouTube.
http://www.youtube.com/user/LL5050

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