Stream Dye

Yuan Wang
Music Technology
New York University
New York, NY, USA
yuan.wang@nyu.edu

ABSTRACT
Stream Dye, presents an intuitive textile interface for interacting with imagery and sound in a three-dimensional (3D) scale space. The interface, called *Fluiiid*, collects data through 3D positional tracking. The data is then processed to control sound parameters and motion graphics. Moreover, the visual feedback is projected on the interface itself so that the visuals can be placed at the exact position where the gestures are performed.

Keywords
Textile interface, positional tracking, touch sensing, visual feedback, interactive performance

1. INTRODUCTION
We often experience visual and acousmatic dislocation [1] through the electronic equipment in our lives—that is, visual and auditory feedback usually takes place far away from where the actions are performed (e.g., through broadcasting, recording, telecommunication). Although these are great technological advancements, the results sometimes come at the expense of intuitiveness in the user's experience—especially in performances and live interactions where novel interfaces are applied.

Fluiiid is an attempt to restore such intuitiveness in the context of interactive multimedia performances. By trying to "relocate" media feedback to the exact place where gestures are performed, the control intimacy [2] of the interface is increased. *Fluiiid* aims to improve the live experience for both the performer and the audience in such a way that the performance becomes more natural and closer to the way we interact with ordinary objects in our daily life—that is, the visual and auditory feedback can be directly seen around the source of the actions.

2. INTERFACE
The interface is made mostly of fabrics including non-conductive fabric as the body and conductive fabric as the touch sensors. For a control interface, it has the advantages of flexibility, endurance, and lightweightness as a result of the material used. The use of white fabric also enables the interface itself to serve as a good medium for the projection of the visuals.

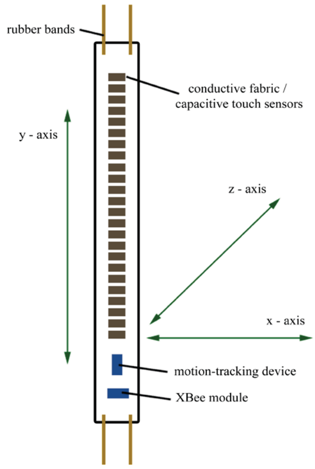

Figure 1. The interface design

For positional tracking, the conductive fabric, served as touch sensors, is cut into twenty-four pieces that are placed equal distances apart on the white cloth, providing twenty-four inputs for the y-axis (Figure 1). Conductive threads are used to connect the capacitive touch sensors to the main circuits (Figure 2). A nine-axis motion-tracking device that is sewn at the end of the interface collects the quaternion data. The raw data is collected through a micro-controller, Arduino, and then translated into positional information along the x-, y-, and z-axes through mathematical calculation.

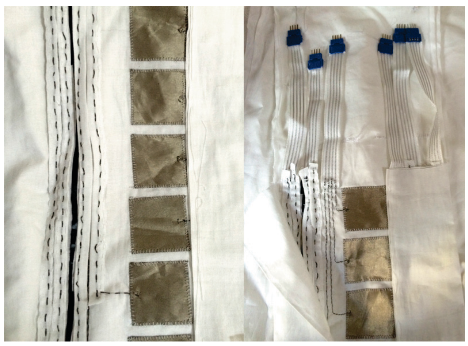

Figure 2. Conductive fabric as touch sensors

The interface is also equipped with an XBee module [3] that enables the data to be sent wirelessly to the computer for further processing. This gives the performer more freedom to interact with the interface while on-stage. Moreover, it will help to reduce the noise of the circuitry that may be caused by the cables.

3. PERFORMANCE

This interactive multimedia performance, *Stream Dye*, is centered on the textile interface, *Fluiiid*. The author, Yuan Wang will present the piece. The performer will improvise with synthesized sound as well as prerecorded samples. By moving her hands along the fabric interface while pulling the fabric in different directions in 3D space, the performer will manipulate the sound effects and visuals in real-time in Max. Based on the hand positions on the interface, the visuals will be projected directly to the same position where the gestures are performed on the interface body (Figure 3).

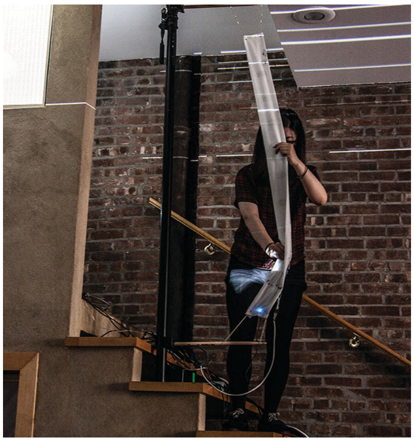

Figure 3. Performance at the Firehouse Space, Brooklyn, NY, USA in 2014. (Photo by Emilio Vavarella)

3.1 Sound

The data coming from the touch sensors on the y-axis are mapped to control the pitch of the sound. Because *Fluiiid* is a polyphonic interface, the performer can perform with both hands and trigger multiple sound sources simultaneously. While the performer is pulling the fabric in different directions, the motion-tracking device will provide the data on the x- and z-axes. The data are then mapped to control a combination of various sound parameters, including timbre, speed, and envelope. Such design allows the performer to generate sound while manipulating audio effects at the same time.

3.2 Visuals

Code-based motion graphics are generated in Processing [4]. The center position of the graphics in 3D space is calculated based on the length of the interface, the y-axis data, and the quaternion data. The quaternion data is also mapped to the color and changing speed of the visuals. By relocating visual feedback and releasing it from a conventional projection screen, this method brings new possibilities for increasing the expressivity of live multimedia performances.

Samples of the performance, see
http://vimeo.com/84949580
http://vimeo.com/101375802

4. REFERENCES

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5. Biography

Yuan Wang received the B.F.A (Honors) degree from Northumbria University, Newcastle, UK in 2008, and the M.Mus. degree in music technology from New York University, New York, NY in 2014. Her Master's degree work focused on developing novel musical interfaces that provide multidimensional gestural control of sound and imagery.