TECHTILE toolkit

A prototyping tool for design and education of haptic media

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ABSTRACT

There has been many haptic devices proposed so far, but most of them are still in emerging stage. To attract the interest of potential users of haptics such as designers, educators, and students, it is necessary to provide easy-to-make and easy-to-use haptic device. We then developed an introductory haptic device named "TECHTILE toolkit". Current prototype is composed of haptic recorder, haptic reactor, and signal amplifier that is optimized to present not only zone of audibility but also low frequency vibrotactile sensation. This toolkit is intuitive to use and can be developed with low cost. We are currently holding a number of workshops to confirm that this device is suitable as an educational tool for learning possible applications of haptics design.

Categories and Subject Descriptors

H.5.2 [**User Interfaces**]: Haptic I/O, Prototyping

General Terms

Design, Human Factors

Keywords

Tactile display, Tactile sensor, Vibrotactile sensation, Multi-sensory communication, Haptic media

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Figure 1: TECHTILE toolkit

Figure 2: Real-time haptic transmission of "balls in a cup"

1. INTRODUCTION

"TECHTILE" is a fundamental concept by combining "TECHnology" with "tacTILE" perception/expression. The TECHTILE project was launched in 2007, and we have been hosted public exhibitions on latest haptic technology in Japan. Our aim is to disseminate the haptic technologies as the third media in the field of art, design, and education and extends the conventional "multi-media" which consists of visual information and auditory information. There has been various haptic devices proposed so far, but most of them are still in emerging stage. In the field of electronics, Arduino [1] has succeeded to provide an introductory platform to make the entry level lower. There are some trials to construct educational platform on haptics [2][3], however, they are designed for university students so that still too difficult for children or designers/artists without

engineering-backgrounds. To attract the interest of “non-professional” potential users of haptics such as designers, educators, and students, it is necessary to provide easy-to-make and easy-to-use prototyping device of haptics. We then developed an introductory haptic device named "TECHTILE toolkit".

2. SYSTEM DESIGN

In designing the toolkit, the most important point is that the toolkit can be used in favorite method for non-professional users. We then focused on the conventional method on auditory media. The sources of auditory sensation and tactile sensation are the same; vibration of an object generates a sequence of vibration of the air and perceived as sound, on the other hand, if the object were touched directly, it would be perceived as tactile sensation. When we create audio contents, we use microphone and speakers. The auditory sensation is recorded as a sequence of sound wave and we can easily edit using sound editors. If we want to share the audio contents on Internet, we can upload audio files (mp3, wmv, wav etc.) on YouTube or other content-sharing websites.

We then designed the toolkit with the same setup as sound tools. Current version of the toolkit (Figure 1) composed of a haptic recorder (microphone), haptic reactors (small voice-coil vibrators), and a signal amplifier that is optimized to present not only the zone of audibility (20-20000Hz) but also low frequency (1-20Hz) vibrotactile sensation. Although this toolkit is intuitive to use and can be developed with low cost, it can deliver even higher-realistic haptic sensation than many other conventional haptic devices.

For example, if the user want to deliver the haptic sensation of “small balls in a paper-cup”, they just need to attach the haptic recorder on the bottom of a paper-cup, and the haptic reactor on the bottom of another cup using scotch tape as shown in Figure 2. Then when they drop balls in the cup with haptic recorder, the haptic sense of collision and rotation of balls would be copied to another cup in real-time. It is also possible to record the haptic signal as an audio track of movie file through the USB port of the toolkit, and playback with video and sound as shown in Figure 3. It means that you can upload your original haptic contents on YouTube or Ustream to share the haptic content all over the world.

Figure 3: Share the recorded haptic video

3. USER EXPERIENCES

We are currently holding a series of workshops mainly for elementary school children and university students as shown in figure 4, so that we have confirmed that this device is suitable as an educational tool for learning possible applications of haptic design. The attendees, aged from 6 to 30’s, could easily understand how-to-use the toolkit in just 10 minutes. After that, they can create their original haptic artworks using their personal belongings such as papers, crayons, scissors, umbrellas, sandals and so on. Figure 5 shows various haptic contents created in the workshops.

Figure 4: TECHTILE workshops

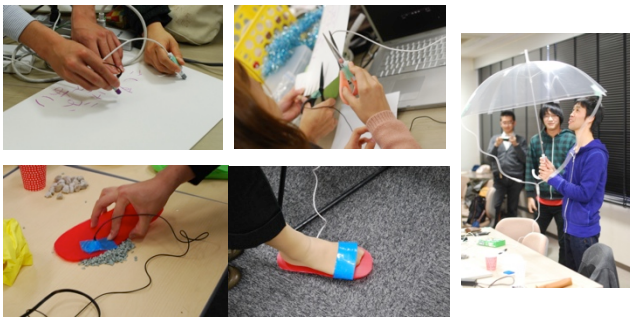

Figure 5: Original haptic contents created by students/children

4. CONCLUSIONS

We have developed a prototyping tool for design and education of haptic media, named TECHTILE toolkit. Through a series of workshops using the toolkit, we are trying to present the possibility and fun of designing haptic contents. In the next step we will construct a platform to share the various kinds of user-generated haptic contents created by students and children.

In Laval Virtual ReVolution 2012, we would like to demonstrate some examples of real-time haptic transmission, recorded haptic videos, and also we will hold rapid hands-on-workshops in our booth to show the essence of TECHTILE toolkit.

ACKNOWLEDGMENTS

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REFERENCES

[1] Arduino, http://www.arduino.cc/

[2] Vincent Lévesque and Karon Maclean. 2011. *Do-It-Yourself Haptics: A Practical Introduction to Haptics for Consumer Electronics*, IEEE ICCE 2011, Las Vegas, US.

[3] Allison M. Okamura, Sonny Chan, Blake Hannaford, Karon MacLean, and William Provancher. 2012. *Best Practices for Teaching Haptics*. IEEE Haptics Symposium 2012, Tutorials, Vancouver, Canada.