Oto-Shigure: An Umbrella-Shaped Sound Generator for Musical Expression

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ABSTRACT

In this paper we introduce Oto-Shigure, an umbrella-shaped sound generator for musical expression. Attention of the music computing community hasn't been focusing on sound output but sound input. However, we argue that in order to make highly expressive sounds, it is significant to increase methods for sound output. Therefore, we developed the new sound-generating device for variety of musical expressions. Oto-Shigure provides two experiences for the user; feel the sounds as if you are bathing in the rain, and easily arrange the rotation of sounds above the umbrella by controlling the sound localization. This is a device not just for musicians but also non-musicians.

Keywords

umbrella, musical expression, sound generating device, 3D sound system, sound-field arrangement.

1. INTRODUCTION

In the last few years, research in the interface of input for musical expressions and generated sounds have been an active area, along with the progressing technology of computer.

Bog[1] is an alien-shaped instrument with grasping interface. The sound with formant synthesis is generated from the speakers. Articulated Paint[2] controls various musical expressions by painting with conductor-like movement. These methods of musical expression can't be invented without the progress of the sensing technology and the speed-up of CPU.

There are various works of sound input systems and generated sounds, though most of the works' sound output systems remain using general speakers, headphones, and earphones. Many diverse sensors and sound synthesis algorithms were created to extend musical expressions, and new methods for musical expressions have been provided one after another. However, to generate more various musical expressions, we considered that it's necessary to use the novel sound output systems. From this, we

developed a totally new sound generating interface for musical expression.

Following are the advantage and disadvantage of the two sound generating devices which have been mainly used.

(1) The speakers have an advantage of generating sound loudly and widely, therefore many people can enjoy it simultaneously. But then, it is difficult to carry them around and also unsuitable to use them with a few people in public space.

(2) The headphones have an advantage of enabling to utilize it in any space. However, they can be used by only one person.

From these, we developed Oto-Shigure which has resolved the problems above. Oto-Shigure realized portable and wireless interface and made it possible for the user to generate sounds anywhere. Additionally, it can be used by not only one person but also with a few people. The maximum volume can be obtained right under the umbrella and people in the distance can not hear the sound, so the user can also use it in public areas.

When the Oto-Shigure is generally used, it has a non-localized sound characteristic. But if connected to the PC and specially processed with the software, it provides sounds from the optional point on the umbrella. The point is fixed by controlling the software running on iPod touch.

Figure 1. Using Oto-Shigure

2. RELATED WORKS

The works with umbrellas have been variously provided. Amagatana[3] is an umbrella shaped portable device. By swinging it, sounds of a sword are generated from the headphone. Rain Dance[4] is an installation content using umbrellas. When the user who is putting up the umbrella passes through the

shower which has the audio vibration, the shower is cut off by the umbrella and a sound is generated.

3. IMPLEMENTATION
3.1 Technique for Generating Sound

The system presented in this work is based on the original sound generating system (Figure 2). Oto-Shigure comes equipped with vibration motors instead of speakers. The vibration motors are attached to each of four tips of the umbrella ribs and they generate sounds by vibrating the whole umbrella cloth. The audio signal from line input is amplified from 100 to 200 times by operational amplifier (LM386)(Figure 3). The amplified audio signal is transmitted to the vibration motors and resonate the ribs and cloth along with the surrounding air.

A sound-generating device, such as a speaker in general, makes point source sound, while our sound generating system enables to make almost plane source sound. That is due to the umbrella cloth that vibrates as a plane and makes the air resonate. This allows making non-localized sound and enables the user under the umbrella to have a quite new experience like bathing in the sound of a rain. Additionally, the umbrellas in general are made of cloth, vinyl and metals, but we used the traditional Japanese umbrella made of Japanese paper and bamboo. Owing to these materials' high sound transmission property, superior sound characteristic and the high sound volume were realized.
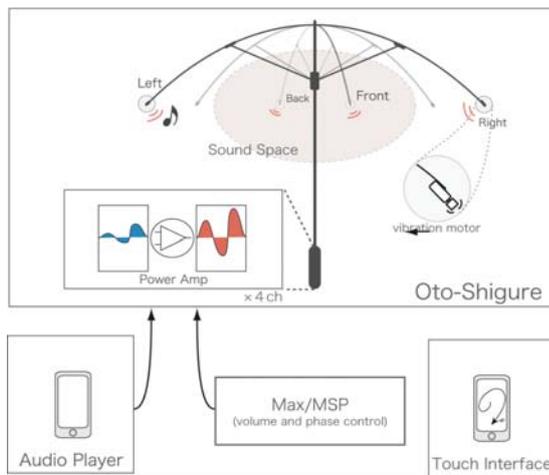

Figure 2. Two Systems of Oto-Shigure

3.2 3D Sound

To generate 3D sounds, the audio signal is processed by computer software. The processed signal goes through the external audio interface and is generated from Oto-Shigure. Specifically, the software splits the input audio signal into four equal signals and controls the volume and phase of each signal, based on the assigned point. This software is developed by Max/MSP.

Through these processing, Oto-Shigure enables to make various musical expressions; locating the sound on the surface of umbrella and generating the surround sound like the 5.1ch surround system. Also, using original interface running on iPod touch enables the user to control sound area intuitively on real-time without complicated manipulation. For example, when the user draws a
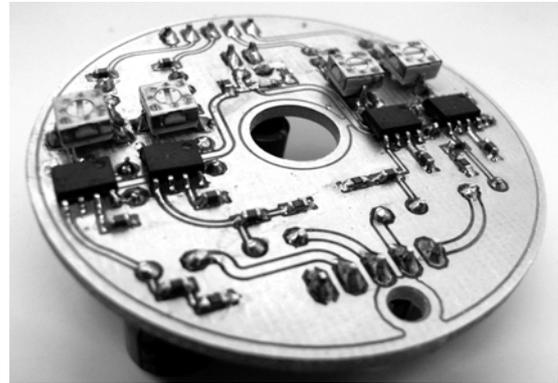

Figure 3. Printed circuit board of amplifier

circle clockwise on iPod touch, the sound and its effect heard from above his head rotating clockwise.

4. CONCLUSION AND FUTURE WORK

In this paper, we explained about the new sound-generating interface which enables the user to develop various musical expressions. There are two ways to generate musical expressions with Oto-Shigure. One is, generating non-localized and airy sounds without any cords. The user can feel as if the sounds of falling rain are encompassing their whole body. Second is, generating 3D sound space under the umbrella by connecting to PC and controlling the interface built in iPod touch. This is the novel sound output system which provides two kinds of quite unlike sounds. Moreover, we will create an interactive content that can be used among multi-users for our future work.

5. REFERENCES

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