ParaSampling: A Musical Instrument with Handheld Tapehead Interfaces for Impromptu Recording and Playing on a Magnetic Tape

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ABSTRACT

For a long time, magnetic tapes have been commonly utilized as one of the physical media for recording and playing music. In this study, we propose a novel interactive musical instrument called ParaSampling, which utilizes the technology of magnetic sound recording, and an improvisational sound playing method based on the instrument. While a conventional cassette tape player has a single tape head, which is fixed in place, our instrument utilizes multiple handheld tape head modules as interfaces. Players can hold the interfaces and press them against the rotating magnetic tape at any point to record or reproduce sounds. In addition, they can easily erase and rewrite the sound recorded on the tape. Using this instrument, players can achieve improvised and unique musical expressions via tangible and spatial interactions. In this study, we describe the system design of ParaSampling, implementation of the prototype system, and discuss the music expressions enabled by the system.

Author Keywords

magnetic recording, sound sampling, tape recorder, sound installation, tangible interface, musical instrument

CCS Concepts

•**Applied computing** → **Sound and music computing;**

1. INTRODUCTION

In this study, we propose a novel instrument for sampling sounds and creating music via tangible and spatial interactions. Because of the spread of digital tools, the sampling process can generally be performed using a GUI on the screen. However, this makes it difficult to share the process with anyone other than the user. To solve this issue, we focused on magnetic tapes, which are used in cassette tapes, as a medium for recording sound [1]. In addition, we used a tape head, which is generally used as a part of cassette tape players, as an interface to record, edit, and play music. We aim to realize a physical musical performance by using several tape heads for recording or reproducing sounds and one rotating magnetic tape. The overview of the proposed instrument is depicted in Figure 1.

To propose a new instrument, we focus on magnetic tapes in this study. Various related works have been proposed with magnetic materials as music-recording media. Sound sphere [4] is a sound installation that is used to randomly reproduce sound by using a sphere wrapped with magnetic tape on which sound information is recorded in advance. Using a cassette tape, which is a linear recording system, and winding the tape around a sphere, this installation attempted to create a new time axis for the recorded sound. Magnetophon [3] by Thonk is a DIY modular playback device created to reproduce magnetic signals. While these projects focus on reproducing sound with magnetic tapes, we propose an interactive musical instrument called "ParaSampling" which enables users to extemporarily record and reproduce sounds and physically experience intangible sound information.

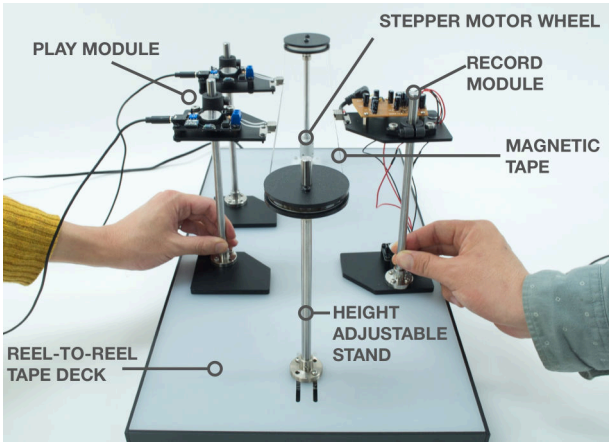

Figure 1: ParaSampling.

2. PARASAMPLING

ParaSampling comprises a device that can both record and reproduce the sound information, a device that can only reproduce sound information, and a reel-to-reel tape deck for recording, reproducing, and erasing the sound information. Users can perform various musical expressions using these devices.

For this system, we designed the following three types of handheld modules: record, play, and erase. As depicted in Figure 3, we utilize a reel-to-reel tape deck to rotate the magnetic tape. The user can record and reproduce the

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sound information by placing the modules on the rotating tape deck.

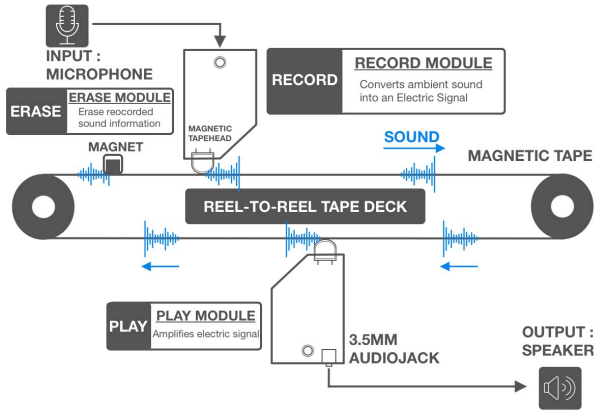

Figure 2: System Overview of ParaSampling.

When the users input their voice or ambient sounds using the microphone embedded in the record module, these signals pass through the tape head and are converted into a magnetic signal, which is then recorded on the rotating magnetic tape. Thereafter, the play module is pressed against the magnetic tape on which the sound information was recorded, and the user will play the sound information. Moreover, by pressing the erase module on the tape, we can easily erase the sound recorded on the pressed part.

Figure 3 shows three types of ParaSampling modules. For the implementation of the record module, we attached the tape head connected to a electric circuit based on wire recorder kit of Otona no Kagaku Vol.23, 2008 [2], onto a handheld stand. For the play module, we designed a circuit to amplify the sound input from the tape head and attached on the stand. We also designed the erase module using a permanent magnet.

The total length of the tape loop is 95.3cm, and we can record about 20 seconds of sounds on the tape when the tape moves at a normal speed (4.76cm/s). By changing the speed using a stepping motor, the pitch of the sound can also be adjusted.

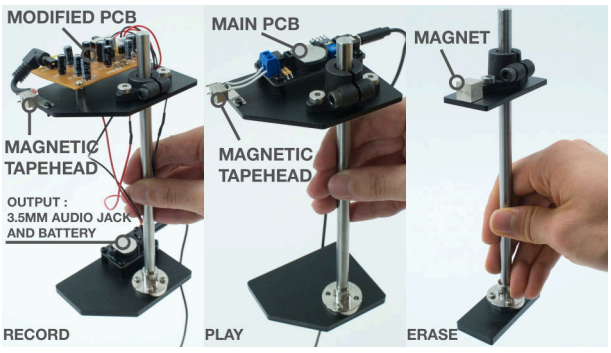

Figure 3: Modules of ParaSampling.

3. EXAMPLES OF USAGE

We have implemented three examples of using ParaSampling. Using the handheld modules we proposed, we can record, edit, and play sounds via tangible and spatial interactions by controlling the number of devices, positions, and the reel-rotation speed.

3.1 Loop

Looping can be achieved by placing several play modules at different positions around the magnetic tape on which sound was previously recorded, and then pressing the devices against the tape to repeatedly play the sound. The number of repetitions changes according to the number of play modules. In addition, by physically changing the positions of the devices, one can perform various musical expressions by varying the tempo of the sound.

3.2 Erase and Play

Because the reel-to-reel tape deck automatically rotates, the recorded sound information loops at a constant speed. The user can change the recorded sound via a chopping effect by pressing a magnet against the magnetic tape on which the sound information was recorded. In this manner, the user can extemporarily erase the sound information from the desired sections.

3.3 Analog Delay

In addition to using several play modules for looping the sound, an analog delay effect can be achieved by adjusting the volume of each play module.

Furthermore, one can perform multiple recordings, similar to a conventional multi-track recorder, implementing these advanced functions is still our future work.

4. CONCLUSION AND FUTURE WORKS

In this study, we proposed a novel instrument that enables impromptu recording, editing, and playing sounds using handheld tape head modules and a rotating magnetic tape.

Presently, the magnetic tape of a cassette player is used as a recording medium. However, as previously described, this results in the lack of durability because the sound information is recorded and reproduced via the physical contact of the devices. In the future, open-reel tapes, which are wider and thicker than cassette tapes, will be used as the recording medium. Furthermore, to prevent the tape from breaking, we will create an attachment so that the tape head can make an appropriate contact with the tape surface.

In addition to improving ParaSampling as a musical instrument, we will develop sound installations by utilizing the linear characteristics of tape media and installing them in larger spaces.

5. ACKNOWLEDGMENTS

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6. REFERENCES

[1] E. Daniel, C. Mee, and M. Clark. *Magnetic Recording: The First 100 Years*. Wiley, 1998.

[2] Gakken. Otona no Kagaku. `http://otonanokagaku.net/english/magazine/vol23/index.html`, (accessed December 2, 2019).

[3] Thonk. MUSIC THING MODULAR – MAGNETOPHON MODULE. `https://www.thonk.co.uk/shop/magnetophon/`, (accessed January 5, 2020).

[4] L. Yagi. Sound Sphere. `https://lyt.jp/sound-sphere/`, (accessed January 10, 2020).