

# Sonic Straws: A beverage-based playful gustosonic system

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## ABSTRACT

We present Sonic Straws, a beverage-based gustosonic system that allows users to experience playful personalized sounds via drinking through straws. The system consists of two straws, a customized lid, and a holder containing a microcontroller. It performs a sensing process via the two straws connected to the microcontroller to sense capacitance, which then generates sounds played back through a speaker. Our aim is to support a playful way of drinking in everyday life because we believe that interactive technology offers unique opportunities to enrich drinking experiences. Ultimately, with our work, we aim to inspire and guide designers working with playful gustosonic interactions to experience eating/drinking as play.

## CCS CONCEPTS

• **Human-centered computing** → **Ubiquitous and mobile computing design and evaluation methods**; *Interaction design*.

## KEYWORDS

drinking, gustosonic, play, human-food Interaction

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## 1 INTRODUCTION

Eating and drinking engage our senses and serve as an important vehicle for social interactions. Consuming beverages including water is a daily activity that we usually repeat multiple times a day and sometimes this activity can be shared with others based on love and companionship [8, 11]. As an adequate daily water intake is about 3.7 liters for men and 2.7 liters for women [3], drink activities play a crucial role in people's daily routines. As a result,

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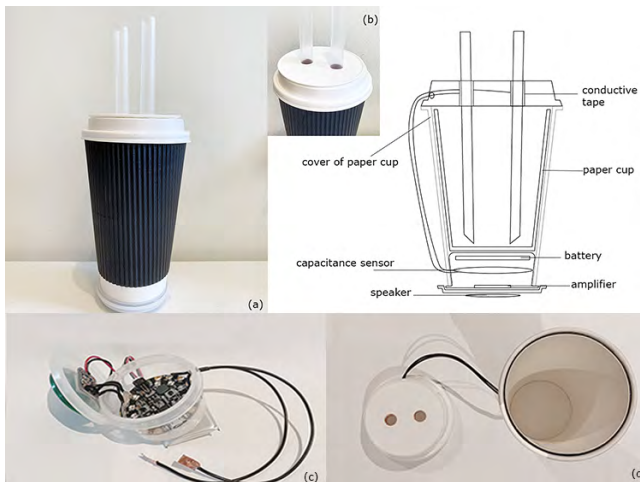
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we note that researchers have become interested in how pervasive technology can promote regular water intake. For example, smartphone apps have been used to send automated reminders to promote water intake [15] and a smart bottle embedded with a liquid-level sensor has been used to detect the quantity of water intake [6]. However, we note that these designs mostly focused on promoting instrumental benefits, i.e., behavior change. In contrast, Grimes et al. [5] argue that we should also focus on designing more celebratory technologies that celebrate the experiential aspects of eating/drinking. Inspired by Grime et al's argument, we propose that a playful approach can facilitate celebrating everyday drinking experiences by enriching it through sounds, resulting in cultural benefits such as entertainment, improved mental and social well-being and cultural delight [4], complementing the aforementioned previously explored benefit of preventing dehydration through promoting water intake through behavior change technology. As such, our work is theoretically suited within the larger aim to facilitate "experiencing eating/drinking as play" [10].

Prior work in HCI noted that sound can offer meaningful engagement and enjoyment in the context of drinking/eating. For example, Koizumi et al. [7] designed "Chewing Jockey", a novel headset that detects jaw movement and plays back augmented chewing food sounds to enrich eating experiences when chewing gummy sweets. Arnold et al. developed a VR game called "You better Eat to Survive!" [1] that utilized chewing noises detected by a sensor attached to the face as a game controller to enrich a virtual reality experience. Wang et al. [13, 14] investigated how playful sounds can enrich eating experiences while eating ice cream. Similarly, the artist Baltz designed "Lickestra" [2], a musical art performance where performers improvise various baselines and tones via licking actions. Lieberman et al. [9] presented "Drink Up Fountain" that talks to the user while they are drinking water from the fountain. When the user's lips touch the water, the fountain playfully "communicates" with the user via pre-recorded sounds. These multisensorial interactions between sounds and the act of eating/drinking are referred to as "gustosonic experiences" [12]. We note that these works listed above were mostly designed for individuals, used sound like a game interface or formed part of an art performance. Hence, knowledge about the design of gustosonic experiences with beverages is still limited. To begin contributing to this knowledge, we present Sonic Straws, a beverage-based gustosonic system that generates playful digital sounds as a result of drinking beverages via straws (Figure 1).



**Figure 1: Sonic Straws system configuration: (a) Sonic Straws consists of a regular paper cup, a customized lid, and a holder; (b) the customized lid with two holes includes removable copper conductive tape for sensing via the straws; (c) our electronics in the bottom container; (d) the paper cup with the customized lid removed for refilling; (d) a schematic illustration**

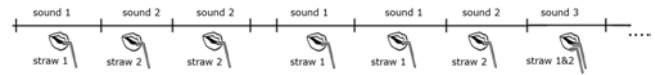
## 2 SONIC STRAWS

Sonic Straws is an exploration of a gustosonic system that dynamically generates playful digital sounds when the players drink any beverage through the straws. The system allows users to play their own personalized sound clips. The system consists of two straws, a customized lid, a holder containing a microcontroller (“Adafruit Circuit Playground Express (CPX)”), as well as an amplifier, and a 3.7V lithium battery, attached to the bottom of a paper cup (Figure 1). Sonic Straws is a portable stand-alone system. It senses capacitance via the two straws connected to the microcontroller to generate sounds played back through the speaker. The detected capacitance data is mapped to trigger sounds when the value goes above a threshold. The sensed capacitance value varies depending on the user’s drinking action via the straws.

The system that can support playing different personalized sounds at the same time (Figure 2). Considering the repeating sipping actions, we set up a sound configuration after 20 trials with different paces of drinking actions. We found that users might disengage with a novel system after the initial excitement vanishes. This has led us to design connected gustosonic interactions to facilitate a more lasting engagement. Inspired by musical instruments, the two straws that can sense drinking actions simultaneously while generating different sounds as a connected sequence. As such, the user can move their mouth between the two straws to create a continuous melody.

## 3 CONCLUSION

We present Sonic Straws, a beverage-based gustosonic system that generates digital sounds designed by players when drinking via



**Figure 2: A connected sonic interaction between two straws with different sounds selected by the user**

straws, in order to further our understanding of how we can experience drinking beverages—such as water—as play to facilitate playful drinking experiences in everyday life.

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