The Peripipe: A Sip-And-Puff Remote Control for Music Playback

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ABSTRACT

We introduce the *Peripipe*, a tangible remote control for a music player in the shape of a wooden tobacco pipe. The interaction is based on breath control, using sips and puffs as control commands. An atmospheric pressure sensor in the Peripipe senses changes in the air pressure. Based on these changes, the pipe determines when the user performs a puff, double-puff, sip, double-sip or a long puff or long sip action, and wirelessly sends commands to a smartphone running the music player. Additionally, the Peripipe provides fumeovisual feedback, using color-illuminated smoke to display the system status. With the form factor, the materials used, the interaction through breath, and the ephemeral feedback we aim to emphasize the emotional component of listening to music that, in our eyes, is not very well reflected in traditional remote controls.

Author Keywords

woodwind controller, tangible interfaces, natural materials, remote control, sip-and-puff

1. INTRODUCTION

Currently, remote controls are commonly being designed as rectangular pieces of plastics, employing multiple buttons that map the desired functionality to the controller. Moreover, graphical user interfaces on computers or smartphones make use of similar metaphors, using mostly virtual knobs and buttons for controlling software such as music players. We argue that these conventional controls for music players, while functional, remain detached from the emotional experience that is listening to music.

Designing a remote control for a music playlist, we wanted the method of interaction to correspond with the qualities of the action performed. As the use of breath is both natural (used since your birth), emotionally loaded (blowing out candles on a birthday cake) and connected to music (wind instruments), we feel that it is an appropriate interaction metaphor for controlling music playback.

Previous implementations of breath-controlled interfaces for accessibility applications have also demonstrated that it is possible to achieve a very high level of control by changing the air pressure using one's mouth [8, 3]. Other controllers, including the *Epipe* [4] and *The Pipe* [6], explore breath

control as a means of musical expression. Unlike these implementations, we did not aim to create a full-scale musical interface but rather an artifact for control, the physicality of which somewhat corresponds with the actions it performs. The Peripipe is crafted from Swedish cherry wood and makes use of the unique aesthetics and qualities that organic materials bring [2]. Additionally, the form factor of the pipe carries cultural value in itself, as smoking pipes have been around for a long time and are connected to meditation and relaxation [5, 1]. Although the numerous health hazards of smoking are now commonly known in western society, smoking pipes currently undergo a revival and are again becoming popular among young people. Providing a hazard-free, yet meaningful pipe as an interface to a music player addresses this trend using the same emotional connection to connect user and technology. Inspired by ephemeral interfaces [7], the user is given feedback in the form of illuminated smoke (see figure 1) which retains a connection to the act of smoking, thus adding to the authenticity of the experience.

Figure 1: The Peripipe remote control uses illuminated smoke as feedback.

2. DESIGN

The Peripipe, as seen in figure 2, consists of a wooden tobacco pipe with an enlarged custom-made bowl, an rFlea Arduino board with ANT+ wireless capabilities, an atmospheric pressure sensor, an RGB LED light, a 9V battery and a miniature smoke generator. The *rFlea* Arduino, the sensor and the LED are all powered by a small rechargeable LiPo battery, while the smoke generator receives its power from the 9V battery. The atmospheric pressure sensor is placed inside the original bowl of the tobacco pipe which is sealed with a cork, forming an air-tight container. This makes it possible to detect small changes in air pressure—either negative or positive—induced by the user applying their breath to the stem of the pipe.
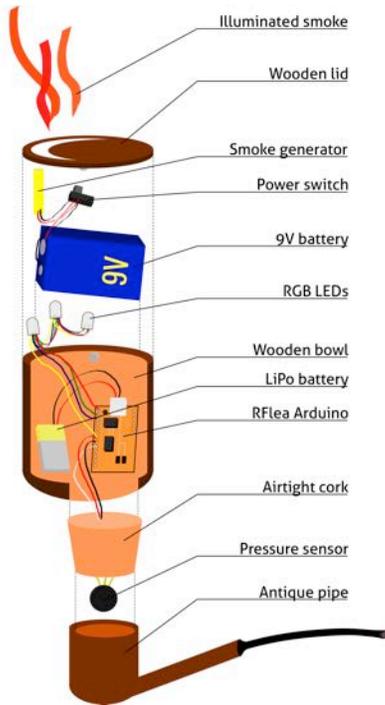
Figure 2: The components used in the Peripipe

3. FUNCTIONALITY

A program running on the rFlea Arduino continuously monitors the voltage values of the atmospheric pressure sensor. Changes are detected by comparing each new sensor value with the ambient pressure measured when the device was powered on. If the detected change is above a certain signal noise threshold, the user has performed an input action and the software goes to the appropriate state. The state changes are then communicated wirelessly from the rFlea to an Android smartphone over the ANT+ protocol and interpreted as commands.

The Peripipe is programmed to distinguish between six distinct types of user inputs: sips, double-sips, puffs, double-puffs, long sips, and long puffs. Sips and puffs are defined as one short inhalation or exhalation into the pipe lasting no longer than 0.4 seconds. If the user inhales or exhales into the pipe for a longer duration, the Peripipe detects a long sip/puff instead. The user can also perform double-sips and double-puffs by doing a second single sip or puff within 0.6 seconds of the first one ending.

The Peripipe gives visual feedback for each user action in the form of illuminated smoke, thanks to an upwards-pointing RGB LED and a miniature smoke generator. Interactions which involve positive changes in the air pressure (puffs, double-puffs and long puffs) are accompanied by a red light pulse. The pulse corresponds to the input type, with single pulses representing puffs, two pulses for double-puffs, etc. Negative pressure changes (sips, double-sips and long sips) work the same way but use blue light instead. The light serves not only as a reminder of what action has just been performed, but also as an indication of possible further interactions. For instance, the user can perform a double-puff as long as the feedback light from the first puff has not yet faded completely.

In the present prototype, the smoke generator is controlled using a separate on-off-switch. Hence, the pipe is smoking throughout the duration of its usage. The original intention was to have the smoke come out in small puffs when an action is performed. However, this would have required additional hardware and a larger wooden bowl, and was therefore left for future design iterations.

4. MUSIC CONTROL

We have mapped the different actions a user can perform with the pipe to the standard controls of a music player: Play, pause, next track, previous track and volume. As playing and pausing the music are the most basic of the mentioned operations, they map to the most basic pipe interaction, i.e. a single puff/sip. Skipping a track or returning to the previous one is done with two consecutive puffs or sips, respectively. Changing the volume requires a more continuous type of interaction, hence a long puff raises and a long sip lowers the volume. The corresponding visual feedback indicates the change with the brightness of the light that accords with the value of the volume. Although more actions and interactions were tested (like "puff-sip" to rewind 10 seconds), we found them quite hard to master. For a limited-application artifact like the Peripipe, there might be a value in itself to keep the functionality simplistic and easy to grasp for a new user.

5. REFERENCES

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