Wubbles: a Collaborative Ephemeral Musical Instrument

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ABSTRACT

This paper presents a collaborative digital musical instrument that uses the ephemeral and physical properties of soap bubbles to explore the complexity layers and oscillating parameters of electronic (bass) music. This instrument, called *Wubbles*, aims at encouraging both individual and collaborative musical manipulations.

Keywords

Wubbles, Ephemeral Interface, Sensabubble

1. INTRODUCTION

1.1 Context

Electronic music, and especially bass music such as dubstep, strongly relies on the creation/manipulation of sound layers. These layers may correspond to different frequency bands (e.g. bass, kick or snare sounds) so as to be able to isolate the processing of each layer. For example, bass sounds are often composed of a basic sinusoid and a number of other layers, each of them bandpass filtered at higher frequencies. These higher layers can then be distorted or echoed without degrading the sinusoid. The layers may also correspond to levels of musical complexity. Basic but heavily compressed kick/snare patterns are often enriched by lighter, more complex percussion rhythms, cymbals or sampled breaks. This music genre also often relies on slow variations of parameters using low-frequency oscillators (LFO) in each layer. For example, a wobbling bass is produced by applying LFOs to different parameters of effects in different bass layers. As the number of layers and parameters being used can be large, these variations allow musicians to focus only on a subset of musical manipulations during live performances, while the other are automated.

1.2 Contribution

Our contribution is a collaborative musical instrument, called *Wubbles*, that explores the layers of electronic (bass) music. It relies on an ephemeral interface - soap bubbles. These bubbles are used as metaphors for the various musical layers that users must preserve (prevent from popping) in order to increase musical complexity. The physical behavior of the bubbles, such as changes in size and speed, is used to control the oscillating parameters in the layers, therefore serving as low frequency oscillators. Furthermore, the popping of bubbles provides an interesting metaphor for the *drops* commonly used in the dubstep genre.

Figure 1: Two users playing with Wubbles. The bubble machine and Kinect-projector pair can be seen on the top right.

1.3 Related work

Wubbles is an ephemeral user interface, i.e. "an interface that contains at least one UI element that is intentionally created to last for a limited time only" [2]. Our system makes use of the chrono-sensory bubble machine introduced in SensaBubble [4]. Instead of using the system for ambient notifications, we are interested in the unique properties of bubbles that makes them interesting / appealing as a collaborative musical interface.

Although other instruments have been based on ephemeral interfaces, such as water, to our knowledge the Ephemeral Melody installation [5] is the only other bubble-based musical instrument to have been built. This installation was a jukebox that produced bubbles en-masse that would collide with pipes, each of which producing a different note. Whereby this instrument used bubbles only for their aesthetic properties and did not afford the user any direct control, our system allows users to control the physical properties and location of the bubbles themselves.

Our instrument is close in its principle to collaborative instruments with shareable objects, particularly those that make use of object's movements such as [3] [6]. However, in our case, the shared objects are ephemeral and their number is highly flexible.

2. WUBBLES

2.1 General approach

Wubbles consists of a software-controlled soap bubble machine and a sound engine developed in Pure Data. The two communicate using OpenSoundControl messages. Soap bubbles are generated and filled with smoke. This enables them to be both tracked using a depth camera and act as a surface that can be projected on to. The creation, properties and deletion of bubbles are communicated to the sound engine. When a new bubble is created, it is assigned to the lowest of six musical layers that is not currently playing, and identified by a projected color. Therefore the musical complexity consistently grows from the base layer as the number of bubbles increases. *Wubbles* is ephemeral so as to encourage collaboration between users. In fact, it is impossible for a single user to keep all bubbles / layers alive. Therefore they have to collaborate in order to increase the overall musical complexity. In addition, the physical properties of the bubbles are hard to control accurately, they rather slowly or rapidly oscillate when modified. As a result of this, they can be connected to musical parameters in order to act as low frequency oscillators. One should note that because many other genres rely on the concept of musical layers and slowly evolving or oscillating parameters, Wubbles can be used as an interface for other genres than electronic bass music.

2.2 Technical details

The implementation of our bubble machine is based on that presented in Sensabubble [4]. As we are interested in producing singular/few bubbles at a time and controlling their size, we developed a system of our own based on bellows, with an air chamber designed to mimic the human lungs and a funnel to act as the mouth. The top of the chamber is covered with an air tight fabric that is pushed/pulled by a servo, thus mimicking the action of the diaphragm. The bellow is rotated towards a pipe connected to the output of the smoke machine, the smoke is triggered, the diaphragm expands, and the bellows are filled. Next, they are rotated downwards through a bubble solution and onwards until horizontal. At this point, the diaphragm slowly contracts, forming a bubble at the end of the funnel. A quick final 'burst' contraction, releases the bubble. The bubble falls into a fan stream, that blows it out into space. A Kinect-projector pair are positioned to capture the bubbles flight. The Kinect tracks the bubbles in 3D space through the depth camera (the smoke enables the bubbles to be seen). The smoke in the bubble acts as a diffuse surface, dramatically increasing the visibility of the projection.

2.3 Mappings

Soap bubbles offer an interesting list of controllable physical parameters that can be obtained using video tracking. Some of these are continuous, such as 3D position, size/ratio, shape, and speed. Other are discrete such as bubbles popping, bubbles collisions, and bubbles bouncing on a surface. The position and size values of each bubble update a physical mass-spring-damper model of the bubble in PureData. This allows us to ensure smoother musical controls, despite the low framerate of the Kinect tracking that result in jump in the values, and at the same time to somehow preserve the physical oscillations of bubbles properties.

The PureData patches currently generate six layers. Each layer is composed of a continuous sound with one or two slowly changing parameters, mapped to either the speed or size of the bubbles, and a discrete sound when the layer is stopped, i.e. when the associated bubble is popped. Each layer adds a level of musical complexity. For example, the first layer is a bass layer with a sinusoid oscillator, a volume lfo and alternatively a base kick or snare sound when popped. The fourth layer is a melodic granular synthesis layer with a granular window size lfo and a melodic sound with delay when popped.

In addition, every time a bubble is popped, the main chord used in all layers is changed, advancing through a predefined cyclic list of chords.

Refering to [1], Wubbles therefore allows for musical control at the timbral (LFOs), note (popping) and process (layers) levels.

2.4 Interaction and collaboration

Wubbles involves both manipulation of individual bubbles and collaborative control of multiple bubbles as a dynamic group. Soap bubbles can be moved by creating air flows around them with the hands or by blowing on them, therefore affecting the continuous sound parameter of the associated layer. The bubbles can also be popped, ending the corresponding layers with a single sound and generating a change in the chord sequence. Finally, bubbles can be split or merged, also influencing the layers.

On the collaboration side, we can distinguish a number of techniques such as sending and exchanging bubbles. Musical cooperation resides in the decisions of popping bubbles or of preserving them, resulting in changing musical complexity and progression in the sequence of chords. Finally there can be concurrent manipulations when two users interact with the same bubble.

The purpose of this demonstration is also to investigate what other interaction and collaboration techniques users can develop.

3. CONCLUSION

In this paper, we presented *Wubbles*, a collaborative musical instrument based on an ephemeral interface: soap bubbles. Physical properties of these bubbles and collaboration between users allow for the exploration of layers of electronic (bass) music.

We see three main follow-ups for this work. The first is the improvement of the tracking system, so that we can extract fast shape and movement variations of the soap bubbles. To that effect, we are currently investigating ways of making bubbles IR reflective. With more accurate data captured on the bubbles, new interaction tools and techniques can be designed to allow for manipulating the bubbles in different ways, therefore increasing the musical expressiveness. Finally, the third follow-up is the in-depth study of collaboration techniques developed by users, which we intend to investigate during this demonstration.

4. REFERENCES

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