
Art/Mo/Sphere: Tangible Virtual Bubble Interface

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Abstract

In this paper we describe our virtual bubble system with which users use an electronic wand to create virtual bubbles that interact with each other in various ways.

Keywords

Tangible User Interfaces, Bubbles, Interactive

ACM Classification Keywords

K8.0. Personal Computing: Games.

Introduction

Soap bubbles are a common and accessible childhood plaything. Bubble wands are used to transfer breath into bubbles of various sizes. Our Art/Mo/Sphere project explores the metaphor of the bubble wand as an interface to a computer system that creates art in a playful way. Traditional soap bubbles are simple, beautiful, and capture the attention of those who play with them. So what makes virtual bubbles compelling? Art/Mo/Sphere is not an attempt to replace natural soap bubbles. Instead, it provides a familiar interface for people to create computed objects that can interact in unique ways. For example, virtual bubbles can exhibit different physical characteristics. They can interact with each other in ways that produce new objects that display interesting visualizations. Virtual bubbles can also be used to point to, or to contain information.

Inspiration

Our goal for this project was to work with the concept of blowing bubbles and measuring wind in a digital environment. Bubbles embody ideas of playfulness, childhood, and simple pleasures, and we wanted to put those ideas into a virtual environment with a tangible physical interface.

Our first concept was to create a "message in a bubble" where spoken words would be captured in virtual bubbles and their messages could be retrieved when the bubble is popped. However, that proved to be beyond the possible scope of our project, so we focused on other ways virtual bubbles could do things that real soap bubbles cannot.

Real bubbles can be different sizes, blown in different directions, and can be popped. Virtual bubbles have fewer limits: they can have different colors and textures, and they can interact with each other in ways beyond combining or popping when they touch.

Previous Work

Previous works have explored the concept of blowing as a user interface input. Udagawa and Moeslinger's "Blowing Gently" (2002) allowed users to control dancing, projected images by blowing into rings [1]. Jellyfish Party (2003), created by Okuno et al., is a project that uses a breath powered device to create 3D bubbles visible to users wearing virtual reality glasses [2]. Jug Hero (2007), a "Guitar Hero" style game featuring jugs, challenges players to blow in time with musical cues [3].

Similarly, previous experimental projects have used projected images to simulate, and extend the metaphor of the painted surface. Daniel Rozin's Easel (1998), used a video projector, a live camera, and a special brush to

project user created images and live video onto a simulated painter's canvas [4].

Project Components

To maintain the spirit of play of soap bubbles, we created two digital wands so that two players can use the system together. Each wand looked like a larger version of a soap bubble wand with a circular loop on top of a handle. The wands contain a light sensor, which is blocked by a piece of plastic that extends into the center of the top loop. When a person blows on the plastic, it is pushed away from the light sensor, giving input which is translated into creating a bubble. The speed of input is measured, so a harder breath will create a faster-moving bubble than a gentle breath.

Each wand also contains an accelerometer, which measures the angle the wand is pointing in. There is an arrow on the screen from which each player's bubbles spawn, and it changes direction in response to the angle of the wand, which affects the direction the bubble will move in. The bubbles travel in that direction until they leave the screen or intersect with another bubble.

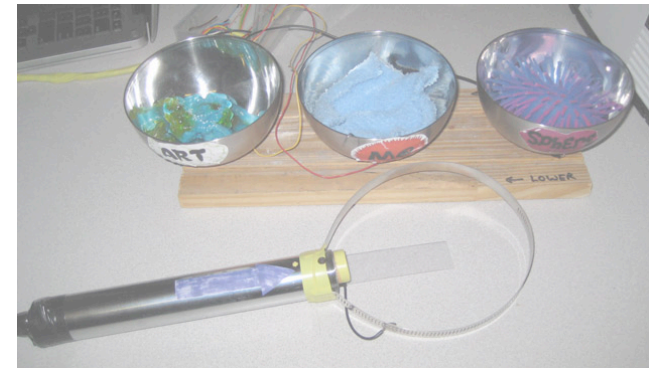


figure 1: The wand and texture bowls.

To distinguish between the two players' bubbles, one wand is red and creates red and orange bubbles, and the other is blue and creates blue and green bubbles. The bubbles can also be three different textures: fluffy, gooey, and spiky. The texture is selected by touching the wand to a bowl containing an item that represents its texture: baby socks for fluffy, melted fruit snacks for gooey, and part of a spiky toy ball for spiky. Touching the wand to a bowl completes a circuit, which is relayed to the computer to change the texture.

Bubbles of different textures interact with each other in a structure similar to a game of rock-paper-scissors: spiky pops gooey, gooey pops fluffy, and fluffy pops spiky. Bubbles of the same color or texture do not affect each other.



figure 2: People trying the wands and learning the game.

Reactions and Possible Future Work

People enjoyed playing with the system, though the relationship between bubble textures was not intuitive and we had to explain it often. For future expansion of the project, we may want to consider other combinations of textures that interact in a more intuitive manner, or perhaps use the texture dipping bowls to explain the relationships, perhaps by including an illustration or sample of the texture that will be popped by selecting the texture in the bowl.

Blowing bubbles by blowing on the plastic in the center of the wand made sense to people. The ease of creating bubbles was somewhat dependent on the amount of ambient light in the room; the light sensors had trouble picking up lower levels of light, which led to users blowing harder to get results and becoming lightheaded or dizzy after a few minutes of play.



figure 3: A user leans her body as she tilts the wand. Photo by Carol Chen.

Changing the angle of the wand to change the direction of the bubble made sense to most users, but some people tried rotating the wand while keeping it vertical instead.

For the background of the game/canvass we used an image of South Hall at UC Berkeley with some clouds. This had some unexpected results: users thought of the game more in a context of graffiti than art since it was projected on the image of a building. An idea to build on this was to try projecting the game on the outside of a building (without the projected background) to see how playing with leaving splotches of color on an actual wall may change how people interact with the game.

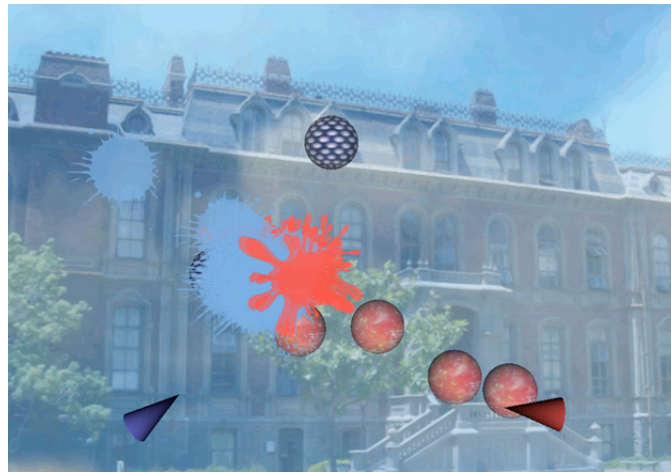


figure 4: A screenshot of a game in progress.

We also tried putting people's faces as a background to try to personalize the game for users, but the images turned out to be too dark to see the bubbles well and distracting from the game. Another possible future exploration could be to try a framed canvas as a background and see if people treat it as a more formal virtual environment.

One of the greatest challenges in the project was figuring out how best to capture the act of blowing, so as to record and utilize the fine control that a human has in producing a stream of air. The challenge was not only to find a way to capture this fine control, but also to put it to use in the game in a meaningful way. In the end we fell short of leveraging the full power of breathing control. The light sensor proved to be too easily affected by changing light conditions based on where it was pointing in the room. Thus the force of the air stream was influenced by the random direction the user was pointing the wand. And secondarily, we chose to make the speed of the bubbles dependent on the strength of the breath. Ultimately the speed of the bubble proved to be a relatively insignificant part of game play. In a future scenario, we envision a game in which extremely fine control of an on screen bubble was needed to win, and this fine control would be achieved by a better method of sensing air flow.

Conclusions

The concept of using physical wands to interact with a virtual world was a success. Most of our interface appeared to be intuitive as we intended, and there is the potential to improve the parts that were not intuitive in future work.

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