

# Bottles as a Minimal Interface to Access Digital Information

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## ABSTRACT

We present the design of a minimal interface to access digital information using glass bottles as “containers” and “controls”. The project illustrates our attempt to explore the transparency of an interface that weaves itself into the fabric of everyday life, and exploits the emotional aspects of glass bottles that are both tangible and visual. This paper describes the design of the bottle interface, and the implementation of the musicBottles installation, in which the opening of each bottle releases the sound of a specific instrument.

## Keywords

Interaction design, ubiquitous, tangible interface, aesthetic interface, containers, controls

## INTRODUCTION

Mark Weiser’s vision of Ubiquitous Computing proposes a world in which computational services can be naturally and “invisibly” integrated into our physical environment [4]. Stimulated by these ideas, we decided to look towards the bounty of richly afforded physical devices of the last few millennia in order to invent ways of re-applying these objects augmented by digital technology. Our search converged on ubiquitous glass bottles. Scattered throughout our homes, bottles have been a part of human culture for thousands of years, serving both practical and aesthetic functions. This paper presents a minimal interface using glass bottles as “containers” and “controls” for digital information. Our goal was to design a transparent interface that could seamlessly weave itself into the fabric of everyday life by providing easy, aesthetically pleasing and emotionally engaging access to digital information for anyone.

The bottles project is a part of the evolving line of tangible interface work [1], which strives to explore interactive techniques that go beyond the currently dominant GUI paradigm. Tangible user interfaces give physical form to digital information, and exploit the human senses of touch and kinesthesia. Their goal is to take advantage of the richness of multimodal human senses and skills developed through a lifetime of interaction with the physical world.

## SYSTEM DESIGN AND IMPLEMENTATION

Our first implementation of a bottle interface used a single bottle as a means of accessing weather forecast information. Although the weather bottle worked well to demonstrate the interface concept, we decided to use multiple bottles in order to explore more artistic contents such as music. Given its cultural significance and wide range of emotional expressions, we felt that music would appeal to a greater number of people by providing rich associations to the aesthetics of the glass bottle interface. We eventually converged on the design of an installation in which multiple sets of bottles could be manipulated over a specially designed table in order to activate music and lighting. In this section, we explain the conceptual model of interaction based on physical bottles. We describe the musicBottles installation and the design of content. Finally, we give a brief description of the technology used in the implementation of the bottles interface.

### Concept: Bottles as Interfaces

When we add new digital meanings and functionality to inert physical objects, we need to maintain coherency of the conceptual model in both the physical and digital worlds. This requires seamlessly extending the metaphor and built-in physical affordances of objects to the digital domain. However, unlike a graphical user interface, which is well constrained by a program, the manipulation of objects in the physical world is much less constrained. As a result, when designing our interface it was necessary to identify a fundamental set of interactions that were both appropriate to the task and also compatible with the available sensor technology. With this set of interactions in mind, we set out to explore the design possibilities.

The basic affordance of bottles is to store content inside, and to access it through removal of the cork. In addition to this, bottles offer a number of other interactions such as shaking and pouring. More sophisticated gestures like these suffer from a greater complexity since they can often be interpreted in different ways. For instance, someone might shake a bottle in order to mix its contents, or simply to see how much is inside. Since our goal was to create an intuitive interface that could be used by anyone, we opted for a minimal design that would implement only the basic affordance of bottles.

Although a bottle interface based only on simple operations is too restrictive to support a variety of functions for

experts, this constraint can be an advantage for providing additional values, such as aesthetic pleasure and emotional richness. We explored this idea through the creation of our musicBottles installation, described in the following section.

### The musicBottles Installation

For the musicBottles installation, we set out to create content where each bottle would represent a singular voice or instrument in a musical piece. Our model for interaction could be represented as multiple synchronized audio streams running in parallel. The manipulation of a particular bottle would cause a particular audio track to be played or muted. The installation consists of set of bottles filled with classical, jazz and techno music, and a custom designed triangular table with a distinct central “stage” area where the bottles are wirelessly sensed (see Figure 1). The table houses three Color Kinetics lights, and the stage area acts as a rear-projection surface for the display of dynamic light compositions that accompany the music. Placing a bottle on the stage area produces a colored visual aura under the bottle as feedback that the bottle is “digitally active.” If the bottle is opened while on the stage, the corresponding music track begins to play accompanied by dynamic colored lighting. Given this simple set of interactions, coupled with visual and audio feedback, it was possible to design a versatile interface while preserving the inherent simplicity and elegance of a glass bottle.

### Technical Overview



Fig. 1 The musicBottles installation and close-up of jazz bottles on table-top.

The bottles interface incorporates wireless sensing technology designed by Joe Paradiso at the MIT Media Lab [3]. Sensing the manipulation of the bottles is made possible through the use of small electromagnetic resonator tags placed around the opening of each bottle, and pieces of ferrite embedded in the corks. The resonant frequencies of the tags are detected through the use of a custom designed tag reader board and sent to the computer via the serial port. A master control program on the computer is responsible for interpreting the tag reader data and generating the appropriate sound and light output.

### USER FEEDBACK

The musicBottles installation was demonstrated at two major public exhibitions at SIGGRAPH 1999 Emerging Technologies [2] and at NTT-ICC, Tokyo in July 2000. During each exhibition, over several thousand visitors

interacted with the installation. Although we did not conduct controlled experiments, we were able to observe a variety of users and receive their feedback.

We found that users quickly understood the bottle metaphor with little or no instruction. Although the sound was obviously generated by the speakers, many people raised the bottles to their ears to see if the sound was literally coming from the bottle. Several users attempted to cover the bottle with their hand rather than corking it to stop the music. This interaction is consistent with the concept of bottles and contents, and therefore caused some confusion when it didn't work.

The overall reaction of visitors was very emotional. Many of them pointed out the aesthetics of the design, and the poetic and magical nature of the bottle interactions as contributing factors to their enjoyment. We also noticed that many people repeatedly visited the installation, and often brought friends. This positive response speaks highly of the appeal and enjoyment that the musicBottles installation provided.

### FUTURE WORK AND CONCLUSIONS

In the future, we would like to implement a variety of different physical interactions, such as the refilling of bottles in combination with special faucets, and we would like to explore new digital contents for the bottles, such as stories. Although the musicBottles was perceived as an artistic installation, we also see some practical applications that go beyond aesthetic pleasure. One of those applications involves medicine bottles. Augmented medicine bottles in a special medicine chest could track a patient's medicine taking patterns, and remind them of prescriptions and medications they happen to forget. The data could also be sent to their medical doctors before a treatment.

The bottle interface suggests an alternative path for making an interface transparent by seamlessly coupling the well-understood physical world with the new digital world. The aesthetics of physical objects can also enrich the digital experience and make it emotionally evocative.

### ACKNOWLEDGMENTS

We would like to acknowledge the Tangible Media Group, the Responsive Environments Group and the Physics and Media Group at the MIT Media Lab. We would also like to thank the musicians who provided content for the bottles.

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