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# Immersive Data Grasping Using the e<sup>x</sup>plore Table

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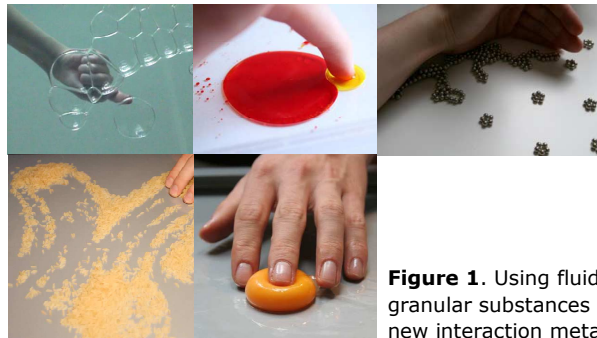
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**Figure 1.** Using fluid and granular substances to inspire new interaction metaphors

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**Abstract**

Accustomed to traditional user experiences with mouse and keyboard, designers are challenged to break free and find new and compelling approaches to interaction design for natural user interfaces. Tangible and embodied interaction works in parallel, is quick, and allows cooperative work. This exploration serves to inspire and provoke critical reflection on interaction design for natural user interfaces based on physical substances that are used in everyday life – like eggs, soap bubbles, and magnets.

**Keywords**

Inspiration, interface design, tangible user interface, physical materials

**ACM Classification Keywords**

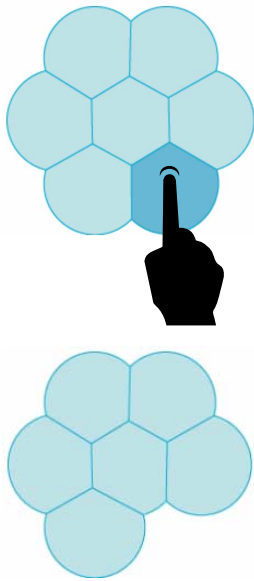
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**General Terms**

Design, Experimentation, Performance

**Introduction**

Natural user interfaces aim to exploit interaction from everyday life that is commonplace and easily learned. However, it is not immediately apparent which interaction paradigms from the physical realm can be adopted for virtuality. We conceived and created the *e<sup>x</sup>plore Table* to capture and explore natural interaction with the intention of eliciting appropriate interface

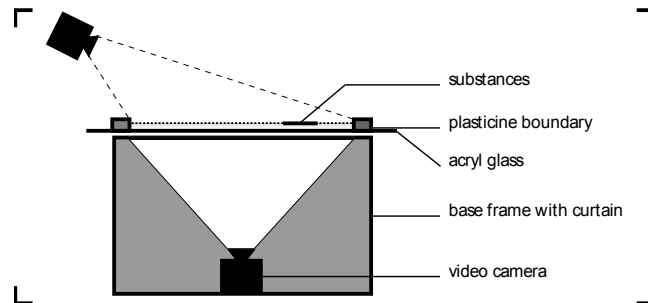


**Figure 3.** The bubbles framework

metaphors for natural user interfaces. It allows experiments with different kinds of substances and enables the observation and recording of the flow of events during interaction with these substances. The basic task used in the experiments is valid both for the real world and virtual interaction: gathering and structuring of items and data, respectively.

### Setup

Figure 2 shows the setup of the e<sup>x</sup>plora Table. Its structure is made up of a wooden base frame with an acrylic glass panel on top. Liquid substances are kept from flowing over by a special boundary. Two video cameras capture user interaction from underneath and above the glass (cp. Figure 1). The results are instantly displayed with a projector and recorded for later review.



**Figure 2.** Schematic setup of the e<sup>x</sup>plora Table

### Engineering Interface Metaphors

The observed flow of interaction with physical substances needs to be adapted, modified, and translated into algorithms as shown by the bubbles framework in Figure 3. For this prototype, ActionScript 3, FlashBuilder, Adobe Flex Framework as well as AS3 Delaunay Library were used by our students. The visual algorithms are based on Voronoi diagrams and mimic

natural behavior of soap bubbles as explored in Figure 1. Bubbles representing data objects can be created, combined, moved and deleted similar to experiences in the real world.

### Conclusions and Future Work

This art exploration provokes thought concerning the interaction design for natural user interfaces. It is important to observe natural behavior of substances to exploit the potentials of new technologies like multi-touch [1] and tracking of whole body movements. As a result, exciting new interfaces can be designed. This meets the demand expressed by Johnny Chung Lee: "Natural interaction is achieved through clever designs that constrain the problem in ways that are transparent to the user" [2].

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