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Spatial Grouping on Interactive Surfaces – Bin & Blub

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Abstract

This demo presents two interaction techniques for grouping items spatially on a tabletop interface. It allows participants of the conference to experience and compare the container technique "Bin" and the proximity technique "Blub". While the container concept is similar to the folder concept on desktop systems, the proximity technique is a novel organic concept based on spatial proximity. Within an associated paper submitted to the main conference track, we studied the characteristics of both techniques in regard to grouping and regrouping performance, grouping strategies and use of multi-finger input. Our study showed that more informal spatial techniques based on proximity are able to harness more benefits of direct-touch multi-finger and bimanual interaction. In our demo, participants will be able to compete in grouping items with both techniques.

1 Spatial Grouping Techniques

Grouping and regrouping digital objects is a common task in various application domains. From creating diagrams, sorting photos to managing files, users need to move single or multiple items around for creating spatial aggregations, collections or clusters. Organizing digital artifacts in a manual way thereby serves as an implicit tool for filtering and synthesizing, thereby taking advantage of human spatial memory capabilities.

Multi-touch interaction bears great potential for supporting the manipulation of individual items and groups of objects more efficiently than it is possible with traditional single pointer desktop interfaces. When the mapping between gesture and action becomes more direct, users can make more use of their spatial memory capabilities and it is easier to move objects. Nevertheless, due to the rich affordances of touch interfaces, it is possible to manipulate virtual objects and groups of objects with not only one hand, but with two hands and multiple fingers, thereby making interaction more analogous to physical interactions in the non-digital world.

2 Bin & Blub

In our research we have developed two spatial grouping techniques based on containment and proximity.

We designed a containment technique "Bin" based on "Storage Bins" (Scott et al. 2005), a container concept for digital tabletops. Mobile and adjustable containers allow for storing and retrieving digital items on an interactive surface. Thus, the classical concept of containment (c.f. folders) was adapted by including eight handles which allow adjusting the bin's shape (see Figure 1, left). Users can add items to the bin and may freely arrange them inside the bin. One may also move the bin itself by dragging it to a new location. A bin provides several ways of interaction as described in the following: 1) *Dragging objects into a bin:* The user may either drag or toss an object directly into a bin. When the item is released inside a bin, it is resized as to show that it is now contained by the bin. Users may also select a group of objects with a lasso selection and may then move this collection into the bin. After releasing the collection, objects are added to the bin. 2) *Collecting objects:* The bin itself can also be used to collect items. Therefore, users can drag the bin directly over objects or adjust the shape of the bin by dragging its handles. After releasing the bin or its handles, objects inside the bin's boundaries are resized to visualize containment. 3) *Spreading a bin:* When objects overlap within the bin, users may use a pinching gesture for getting an overview on the bin's contents. When applying this gesture, objects are slightly moved so that no overlapping items remain.

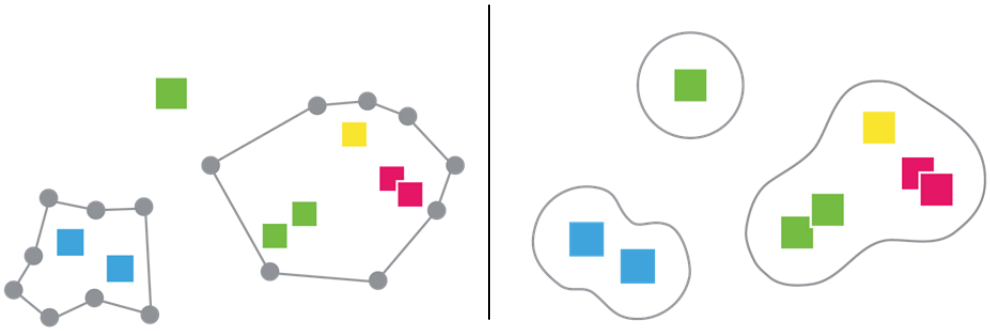

Figure 1: Grouping items based on containment (Bin) and based on proximity (Blub)

For the proximity technique we adapted "Bubble Clusters" (Watanabe et al. 2007), an organic concept of proximity for spatial object and group manipulation on mouse-operated desktops interfaces. Therefore, each object is surrounded by a bubble, which adjusts its boundaries organically according the number and positions of objects in close proximity (see Figure 1, right). This bionically-inspired concept can be compared with merging water drops or colliding soap bubbles, hence making grouping more natural. Our multi-touch adaptation "Bubble" provides following interaction techniques for visually organizing items: 1) *Group by object:* Two items join one bubble if they are positioned close to each other. To do so, the user drags an object to another object and as soon as their boundaries touch each other, bub-

bles melt, creating a new, larger bubble. 2) *Group by bubble:* Users can also move bubbles by dragging the bubble shape to a new position. After releasing it, overlapping items or other bubbles are merged, when applicable. 3) *Splitting a bubble:* Users may also split a bubble by drawing a stroke with the finger across the bubble shape. The bubble then splits and two new bubbles result. 4) *Spreading a bubble:* Similar as in the Bin technique, a pinching gesture can be used to get an overview on the bubble's items. When applying the gesture, overlapping objects slightly move to new positions and the bubble adapts its surrounding boundary.

Figure 2: Interacting with Bin and Blub on a Microsoft Surface tabletop

3 Demonstration

In our demonstration, participants of the conference will be able to compete against each other with both techniques. Our demo will be presented on a Microsoft Surface table, measuring 24" x 18" with 1024 x 768 px screen resolution. For the demo, we designed a game-like task of grouping 30 spatially distributed rectangles according to five different colors. Each game round covers a grouping and a regrouping phase: 1) The rectangles appear distributed randomly on the surface. 2) Then, participants are asked to group shapes according to colors. 3) After a five second break, the colors of the shapes are shuffled and participants may group the objects again. 3) The fastest time is recorded and listed on a high score table for later comparison. As part of our demo, well performing participants will be awarded with a package of soap bubbles.

References

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