FLEXIBLE, COLLABORATIVE ORGANIZATION ON A TABLETOP

Karen D. Grant and Terry Winograd

Computer Science Department
Stanford University
Stanford, CA 94305
{kgrant, winograd}@cs.stanford.edu

Abstract

As part of our research on designing computer-based systems for organizing materials, we have conducted several qualitative and quantitative investigations of tabletop use both with and without technology.   We are interested in exploring more flexible metaphors for organizing materials, such as an informal "pile"-based metaphor, in a collaborative setting around a tabletop. Our goal is to provide more casual, flexible systems for everyday users.

Research Vision

We envision that there might be abundant opportunities for interaction on post-desktop surfaces that may include tables in public spaces, offices, homes, and schools. We hope that new interfaces for such surfaces will be flexible and fluid enough for novices and experts to use, and that they will easily support collaboration. We hope that the unique properties of tables will be taken advantage of, including allowing people to comfortably move or sit around a large surface in a setting they are familiar with in everyday life. We also hope the computer's capabilities are employed, for example, by creating additional space by altering the size of images and by distorting them. We envision utilization of the computer for archiving images, logging actions, and representing multiple versions of images and image groupings. This approach will allow for novel uses, particularly informal group activities, including the sharing of stories and memories.

In workplaces, schools, and homes, electronic materials are increasingly used in information-rich collaborative projects; however, current tools to help categorize such materials are typically constraining or nonexistent. As more users bring their own pre-existing electronic collections to a project, and as electronic content collected throughout a project becomes increasingly essential to a successful task outcome, this need for appropriate and powerful categorization systems will increase. Currently, when users organize non-electronic materials, such as photographs, they use techniques ranging from flexible methods, such as creating loose piles, to very structured approaches. Current computer-based collaborative systems only support the more rigid methods in which an inflexible classification system, such as file folders, must be set up early in the organization phase of the task. In addition, the majority of organizational tools are designed only for a single user. We envision computer-based tools and metaphors that can support less rigid organizational methods in a collaborative environment.

Workshop Issues

By helping to organize this workshop, we hope to facilitate a gathering of researchers who are interested in exploring collaborative tabletop environments, and in forming a shared understanding of the major questions, gaps, and issues in this area. Subjects that may be interesting to discuss include:
- New tabletop interface metaphors and interaction techniques.
- Exploration of task domains and user groups that might best benefit from shared tabletops.
- Innovative input devices that support collaboration.
- Obstacles and special needs to overcome.
- Experiences others have had in both qualitative and quantitative research studies.

Current Research Direction

As groundwork for designing flexible computer-supported organizational tools, we have been conducting a series of experiments to study how people organize photographic materials. We have performed these experiments on a traditional physical table as well as on a computer table. One of the core interaction metaphors we are extending onto the computer tabletop is the pile metaphor introduced by Mander [5] and Malone [6].

Our computer table, the iTable, is bottom projected and has a 3-by-4-foot display embedded in a wooden rim of a conference table. The iTable is part of the iRoom [4], a prototype interactive workspace located in the Computer Science Building at Stanford University. We are currently using eBeam ultrasonic pens as input devices.

Figure 1: Subjects working with film photographs on traditional table

Figure 2: Subjects working with digital photographs around computer table in the iRoom

In a recent study, we explored how people collaboratively organize photographs on a traditional table (figure 1) and on a computer table (figure 2) with a work area of the same size.

We first observed pairs of users organizing a set of conventional photographs on a conventional table. We had the subjects work with photographs (still frames) from the movie "The Wizard of Oz" (1939), which all subjects had seen. By using a set of photographs with strong characters, places, themes and a narrative storyline that all of our subjects were familiar with, we were able to simulate, in a controlled setting, a typical task situation in which people organize photos of personally familiar people and events with other people familiar with the material. We then had the same subjects organize a different set of still frames from the movie on our computer table, for which we had implemented a simple pile-based organizing facility. This tool was not a comprehensive photo-organizing system that could handle input, output and files. Our tool was built specifically to test the use of piles. We collected videos of the sessions, logs of captured interactions, and surveys that each subject completed. We are currently analyzing the results of these studies [3].

We are particularly interested in the issues of image grouping, relationships, annotation, multi-tiered categorization, ordering of images, visual representations, space usage, collaboration support, control and contention among users, orientation, rotation, support for the separation of private and public spaces, and special interactions to support piles on a tabletop.

Authors' Backgrounds and Motivations

Karen Grant is a Ph.D. candidate in the Computer Science Department at Stanford University. She is part of both the Interactivity Lab headed by Prof. Terry Winograd and the Digital Libraries Project. She has produced and designed children's software in industry, and is interested in software that supports collaborative play and storytelling. Karen's current research interests include human-computer-interaction design, tools for collaborative knowledge gathering and organizing, CSCW, and shared tabletop displays. She received a B.A. from Harvard University; an M.S. from London School of Economics and an M.S. from Stanford University. She can be contacted at kgrant@cs.stanford.edu.

Dr. Terry Winograd is a Professor of Computer Science at Stanford University. His focus is on human-computer interaction design, with a focus on the theoretical background and conceptual models. He directs the teaching programs in Human-Computer Interaction and HCI research in the Stanford Interactivity Lab. He can be contacted at winograd@cs.stanford.edu.

Abbreviated Tabletop Bibliography

1. Arai, T., Machii, K., Kuzunuki, S. and Shojima, H. InteractiveDESK: a computer-augmented desk which responds to operations on real objects. *CHI Companion '95*. 141-142.

2. Dietz, P. and Leigh, D., DiamondTouch: A Multi-User Touch Technology. in *UIST '01*, (Orlando, FL, 2001), ACM Press, 219-226.

3. Grant, K.D., Graham, A., Nguyen, T., Paepcke, A. and Winograd, T. Beyond the Shoe Box: Foundations for Flexibly Organizing Photographs on a Computer. *Submitted for Publication*. http://dbpubs.stanford.edu:8090/pub/2002-45.

4. Johanson, B., Fox, A. and Winograd, T. The Interactive Workspaces Project: Experiences with Ubiquitous Computer Rooms. *IEEE Pervasive Computing Magazine*, *1* (2).

5. Malone, T.W. How do people organize their desks?: Implications for the design of office information systems. *ACM Transactions on Information Systems (TOIS)*, *1* (1). 99 - 112.

6. Mander, R., Salomon, G. and Wong, Y.Y., A 'pile' metaphor for supporting casual organization of information. in *CHI '92*, ACM Press New York, NY, USA, 627 - 634.

7. Streitz, N.A., Geißler, J., Holmer, T., Konomi, S.i., Müller-Tomfelde, C., Reischl, W., Rexroth, P., Seitz, P. and Steinmetz, R., i-LAND: an interactive landscape for creativity and innovation. in *CHI '99*, (Pittsburgh, PA, 1999), ACM Press, 120 - 127.

8. Wellner, P., The DigitalDesk calculator: tangible manipulation on a desk top display. in *UIST '91*, (Hilton Head, South Carolina, 1991), ACM Press, 27 - 33.

9. Wellner, P. Interacting with paper on the DigitalDesk. *Communications of the ACM*, *36* (7). 86-97.