

# The Designer's Outpost: A Task-Centered Tangible Interface for Web Site Information Design

**Scott Klemmer, Mark W. Newman**

Group for User Interface Research  
Computer Science Division  
University of California, Berkeley  
Berkeley, CA 94720-1776 USA  
+1 510 643-3043  
{srk, newman}@cs.berkeley.edu

**Raecine Sapien**

Department of Computer Science  
Texas A&M University  
College Station, Texas 77843-3112 USA  
+1 409 862-3217  
rsapien@cs.tamu.edu

## ABSTRACT

The Designer's Outpost is a tangible user interface that combines the affordances of paper and large physical workspaces with the advantages of electronic media to support information design of web sites. We are developing a system to support the practices used by designers during the early phases of information design. We have created and evaluated a low-fi prototype, and are implementing a revised design. Designers will interact with the system by writing on physical Post-it Notes, arranging them on the digital desk in related groups, and drawing links between them. The system tracks the Post-its using computer vision and captures links among Post-its and groups with a stylus.

## Keywords

Tangible interface, augmented reality, web design, sketching, information architecture, computer vision

## INTRODUCTION

In earlier work, we conducted an ethnographic study into web design [4]. The study consisted of interviews with eleven professional web site designers from five different companies. We learned that designers create many different representations of a web site and that the production and use of these intermediate artifacts dominate the day-to-day work practice. One of our general research interests is in supporting informal interactions during the early phases of design. Focusing on the sketching and storyboarding aspects of web site creation, we have built DENIM [2]. Outpost complements this work, supporting high-level information design.

Outpost is motivated by the design practice of arranging Post-it Notes on a large surface such as a wall, table, or desk. Designers write information on Post-its and stick them to the wall. They move the notes into spatially



**Figure 1.** Designers arranging Post-its on the desk

proximate groups representing categories of related information. Groups are labeled and further grouped into hierarchies. The structure of hierarchical groups becomes a baseline for the structure of the final web site. Beyer and Holtzblatt describe a version of this practice called "Affinity Diagramming." [1]

## LOW-FI PROTOTYPES AND USER TESTING

We began the project with detailed task analysis and user tests. We created a low-fi prototype using poster board and Post-it Notes to explore the possible interactions. We ran a series of user tests and, based on observations, produced an early interactive prototype that used only "virtual" Post-it Notes. Our current work is motivated and inspired by these prototypes and the user feedback.

## OUTPOST INTERACTION TECHNIQUES

The goal of the Designer's Outpost is to provide a tangible user interface that combines the affordances of paper and large physical workspaces with the advantages of electronic media to support information design for the web. The user interacts with the system by writing on Post-it Notes. We mandate that the note writing occur on a digitizing tablet; this restriction gives us high-resolution ink capture of the note.

Users can then place notes on the ITI Digital Desk (Fig. 1), a large display screen the size of a drafting table, and arrange them into groups. The user can also use a stylus directly on the desk surface to perform other kinds of interactions with the system, such as linking notes and specifying group labels.

Visual feedback is provided to indicate the system's interpretation of the group boundaries and to enhance the sense of group cohesion. One Post-it from a group can be selected as the group label. Labels are displayed by the system with distinguishing highlights and borders. Outpost supports linking Post-its to each other and to groups of Post-its, a feature that is not readily provided by the existing practice of grouping Post-its on a wall. If a user draws a line on the desk from one Post-it to another, we display the line with an arrowhead at the end. The Outpost site structure will be available for import into DENIM to serve as a baseline site map for further exploration and refinement of the site. Individual Post-its map to DENIM web pages.

The large workspace permits the representation of a complex information space without losing contextual, peripheral information. The persistence of the artifact supports asynchronous collaboration and awareness of the state of the project. The space allows multiple people to simultaneously view, discuss, and modify the artifact. An interactive display surface affords gesturing and drawing directly on the surface. Automatic information space capture enables physical configurations to be both persistent and interactive. Finally, the creation and exploration of the information models uses cheap, readily available materials.

After placing Post-its on the desk for the first time, users are free to keep or discard the physical Post-it. Because web site design takes place over an extended period of time, users may find it convenient to throw away the mass of Post-its, or they may lose them. The virtual Post-it stays. We retain the haptic feel of notes after they are discarded with generic Post-it *frames*: a piece of note-sized thin, clear Plexiglas. Placing a frame onto the desk will "attach" the two. Users can then move the physical frame around to move the page in the virtual space.

#### RELATED WORK

Desk interfaces have a rich legacy. Ullmer et al explain the success of the metaDESK [5]: "[it] has a certain legibility of interface in that its affordances suggest and support user's natural expectations from the device." Recently, Moran et al presented Collaborage [3], a camera captured whiteboard. We draw from Moran's research on spatially organizing material over large surfaces. There is a haptic aspect to paper-based design that is missing from even informal screen-based design tools. Wellner notes that "Consequently, we have two desks: one for 'paper pushing' and one for 'pixel pushing.'" [6] The goal of Outpost is to have the best of both worlds; in our system paper pushing is pixel pushing. Our paper interface uses off the shelf Post-its, completely passive and untagged.

#### OUTPOST INFRASTRUCTURE

We use two cameras for image input. One camera is mounted inside the desk, tracking the location of Post-its without being occluded by the user, as the metaDESK did [5]. The second camera is ceiling mounted. Like Wellner, our ceiling camera captures a low-resolution version of the document. The user writes notes on the tablet, enabling the system to capture a high-resolution version of the data.

The feedback Outpost provides is near-interactive. The system automatically categorizes camera frames as being calm or busy. When busy frames occur, the system knows that objects are moving. When the system becomes calm again, it uses the difference between the last calm frame and the new state to determine what has changed.

#### CONCLUSIONS

Outpost is a task-centered tangible interface for web site information design. Its functions are informed by observations of real web site design practice and we believe it provides many of the affordances of current tools and practices while offering the advantages of electronic media.

We have described user interaction with Outpost. To date, we have assembled the hardware and completed a substantial portion of the software infrastructure. In the near future, we intend to finish the implementation of the design described here, and validate Outpost's usefulness with practicing web designers.

#### ACKNOWLEDGEMENTS

We thank James Landay and John Haddon for their help.

#### REFERENCES

1. Beyer, H. and K. Holtzblatt. *Contextual Design*. Morgan Kaufmann Publishers, Inc., San Francisco, 1998.
2. Lin, J., M. W. Newman, J. I. Hong, and J. A. Landay. DENIM: Finding a Tighter Fit Between Tools and Practice for Web Design Design. To appear in Proceedings of *Human Factors in Computing Systems: CHI 2000*. The Hague, The Netherlands, April 1-6, 2000.
3. Moran, T.P., E. Saund, W. van Melle, et al. Design and Technology for Collaborage: Collaborative Collages of Information on Physical Walls. In Proceedings of *Symposium on User Interface Software and Technology: UIST 99*. pp. 197-206, November 1999.
4. Newman, M. and J.A. Landay, *Sitemaps, Storyboards, and Specifications: A Sketch of Web Site Design Practice as Manifested Through Artifacts*. TR UCB//CSD-99-1062, UC Berkeley, Computer Science Division, Berkeley, CA, September 1999.
5. Ullmer, B. and H. Ishii. The metaDESK: Models and Prototypes for Tangible User Interfaces. In Proceedings of *Symposium on User Interface Software and Technology: UIST 97*. pp. 223-232, October 1997.
6. Wellner, P. Interacting with Paper on the DigitalDesk. In *Communications of the ACM*, Vol. 36 No. 7, pp. 87-96, July 1993.