

DENIM: An Informal Sketch-based Tool for Early Stage Web Design

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Abstract

DENIM is a system that helps web site designers in the early stages of design. DENIM supports sketching input and gestures for operations like pan, cut, copy, and paste; allows design at different refinement levels—site map, storyboard, and individual page; and unifies the levels through zooming. DENIM uses very little sketch recognition, and when recognition is used, the sketched ink is almost always unchanged. We chose this informal interaction so that designers could concentrate on designing web sites without being distracted by recognition technology.

Introduction

DENIM is a system to assist designers of web sites in the early stages of information, navigation, and interaction design (Lin et al. 2000). It is an informal pen-based system that allows designers to quickly sketch web pages, view them at different levels of detail, create links among them, and interact with them in a run mode.

The design of DENIM was informed by an ethnographic study of professional web site design practice (Newman and Landay 2000). Two of the major findings were:

- Designers usually sketch on paper during the early stages of design. To support this, DENIM's primary mode of interaction is sketching.
- Designers sketch at three different levels of detail: *site maps*, *storyboards*, and *individual pages*. DENIM unifies these views through *zooming*.

We built DENIM using the Java 2 SDK version 1.3, on top of SATIN (Hong and Landay 2000), a toolkit for building programs using informal pen-based interaction.

The DENIM User Interface

DENIM has one window (see Figure 1) with three main areas. The center area is a canvas where the designer can create web pages, sketch the contents of those pages, and draw arrows between pages to represent their relationship to one another. The canvas is of infinite size, and the designer can pan the canvas in any direction.

On the left is a slider that reflects the current zoom level and allows the level to be set. There are five levels: overview, site map, storyboard (Figure 1), page, and detail. The middle three levels map directly to the most common rep-

resentations of web site designs that we observed during our study of web site design practice.

The bottom area is a toolbox that holds tools for drawing, panning, and erasing.

As part of our effort to support pen interaction in DENIM, we use pie menus (Callahan et al. 1988) instead of pull-down menus for executing commands, and gestures for issuing common commands. In DENIM, gesturing means holding down the button on the pen's barrel while drawing a shape. DENIM also provides feedback on gesture recognition by displaying an exemplar of the type of gesture recognized. This feedback is important for helping designers understand what gesture has been recognized properly.

Interacting with DENIM

Using DENIM consists of creating and editing pages, linking pages together with arrows, and testing the design in Run mode.

Creating and Editing Pages

In DENIM, web pages are accompanied by a label that represents the name or description of the page. The labels remain the same size throughout all the zoom levels, so that they are always readable.

There are three ways to create a new web page:



Figure 1. The DENIM user interface in Storyboard view

- Write some words on the canvas while in site map or storyboard view. These words are automatically grouped together based on proximity but are still presented as handwritten strokes. A blank page is created with those words as its label.
- Draw a rectangle, which is recognized as a web page and converted to a page with a generic label.
- Insert typed text by gesturing a caret, and then type in the page's label.

Designers often create and organize labels to construct an information architecture, before any page-level details are sketched. Later, the designer can zoom into storyboard or page view and sketch inside the pages. If the designer writes letters inside a page by hand, DENIM will group the letters together into words, and words into phrases. This grouping also makes it easier to create hyperlinks.

Arrows

An arrow between two pages represents a relationship between those pages. It can represent a general relationship or the behavior of an actual hyperlink. To create an arrow, the designer draws a stroke between two pages. If an arrow starts from a particular item in a page, such as a word, image, or button, then the source of the arrow becomes a hyperlink and turns blue.

Like handwritten text, arrows are presented exactly as they are drawn. The arrow recognizer uses simple rules to detect an arrow and link the source of the arrow to its destination.

Run Mode

After a number of pages have been sketched and arrows drawn between them, it is possible to preview the interaction by entering Run mode. By opening a pie menu over a page and selecting File→Run, a separate DENIM browser window opens up with that page. The designer can then navigate through the sketched design like in a web browser, by clicking on the hyperlinks in the page and using the Back and Forward buttons. With Run mode, designers can test the interaction with a site that they are designing without having to create a full-fledged prototype.

Evaluation and Feedback

We informally evaluated the sketching aspect of DENIM with seven participants, five professional web designers and two non-web designers (Lin et al. 2000). The evaluation yielded positive comments, subjectively rating high on usefulness and fair on usability. We found that the participants were enthusiastic about DENIM's concepts and would like to use such a system in their work.

Since then, we have posted three beta versions of DENIM on the web¹ for designers to download and evaluate. In the

past 1½ years, DENIM has been downloaded over 4000 times. We plan to do a follow-up questionnaire to discover how people are using DENIM, what they like or dislike about it, and what features they want in the next version.

Future Directions

In addition to the questionnaire, we are planning to do a long-term study of designers using DENIM to see what features they use and how it affects their work practices.

We are also working on ways to better analyze the usability and effectiveness of a web site designed in DENIM. We have added the ability to export a DENIM design as a set of HTML pages, which can be posted to a web server that anyone can access. We have also created a tool that logs a user's path through a web site and then display a visualization of the path data.

We have devised and implemented extensions to support the design of more sophisticated web interfaces as well as traditional GUIs (Lin 1999), including methods to allow designers to specify their own reusable components. These components can be as simple as a new kind of widget or as complex as a template for a web page. We plan to continue implementing and studying these extensions in the future.

References

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¹ <http://guir.berkeley.edu/denim/>