Using Knowledge Anchors to Reduce Cognitive Overhead

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Web publishing offers a major advantage over traditional print-based methods because it can link to external documents or other places within a lengthy document. Hypertext can potentially connect to any information on the Internet, including both data and executable programs. Thus, links not only let authors create dense, complex works that would be difficult to read in a linear fashion, they also let them incorporate into their online documents a rich array of multimedia such as audio and video.

Existing Web development techniques rely on static links that map back to an existing pointer or index entry in the underlying system. Such hard links imply the existence of only one correct relationship for any given hypertext document and all potential users. The author alone is thus logically obligated to insert and modify every anchor—the point within a frame from which the user can trigger an internal or external link to explore a new subject or expand on the current one.

The author must also determine how these changes affect all other existing anchors to determine whether new links should be inserted in either direction, a task that grows exponentially as the author proceeds.

COGNITIVE OVERHEAD

These demanding requirements result in two forms of cognitive overhead, a well-known Web design problem that Jeff Conklin defined as “the additional effort and concentration necessary to maintain several tasks or trails at one time” (“Hypertext: An Introduction and Survey,” Computer, Sept. 1987, pp. 17-41).

This leads to anarchy at the macro level: Following the same path through the Web usually leads to different outcomes, and too often links return a “Forbidden—you don’t have permission to access” or “Document not found” error message. A document that is available one day may be gone or completely rewritten the next, thus destroying its relevance to the user. To control versioning, authors restrict jumps to their own material, which severely limits their Web site’s potential value.

In response, researchers have developed maps that show either an overview of the entire system—usually incorporating some degree of layering to lower visual complexity—or the routes leading from the current frame, but these efforts have thus far proved ineffective.

KNOWLEDGE ANCHORS

We believe that a more practical and effective approach is to use bidirectional knowledge anchors. These are points within a frame that have significance to the author—and later to the reader. A knowledge anchor is the point within the frame from which the user can trigger a link. An anchor designates either an area from which a reader may want to branch to investi-
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Steps to Construct Knowledge Anchors

Once an author has created a frame, constructing a knowledge anchor only requires following a few simple steps:

- Identify all of the knowledge anchors within the frame—new areas where the reader may want to explore or expand on the current one.
- Create the inward list of concepts describing the anchor’s context (or why a reader might like to jump there).
- Create the outward list of concepts describing material that the author believes the reader might want to see.
- Verify that the anchors have generated appropriate links.