

# Working Towards Rich & Flexible File Representations

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## INTRODUCTION

Personal computers provide users with access to ever larger data stores. How can graphical user interfaces better support the management of increasing numbers of files? This paper suggests that we might aid users in recognizing and locating information by improving file representations.

Today, icons are commonly used to represent files. In recent years, they have become increasingly more expressive. Initially, in command line systems, text labels alone were used to identify files. With the introduction of graphical user interfaces, generic document and application icons were introduced (see fig 1a). Over the years, file icons took on an appearance that reflects the application used to create them (fig 1b). More recently, some applications (e.g. Adobe's Photoshop, Apple's QuickTime MoviePlayer) produce file icons that serve as proxies[2] of the document's contents (Fig. 1c). These proxies are essentially visual miniatures of the document. There are, however, other types of proxies possible. This paper builds on the recognized trend toward information-rich icons. It provides several examples of how systems can emphasize a file's unique characteristics and thereby facilitate the often necessary task of browsing.

### *Examining the richness of the physical world*

The forms and containers of items that we interact with in the real world provide richer recognition clues than those on our computer desktops. The items on the bookshelf (Fig. 2) are memorable – their various shapes, sizes and colors provide meaningful information about their contents and media. For example, the dictionary is easily found because it is large and red. The cassette case indicates that a video tape – and not the pages of a book – is inside. The pens look as if they can be used for writing and drawing, since they are shaped like familiar writing implements. If we strip the bookshelf of those clues – putting each item in the same sized box with only a brief description and media-type icon printed on the surface (Fig. 3) – it is harder to distinguish between items. Containers are no longer memorable or clearly indicative of content. This example of impoverished representation is analogous to what we see on our computer desktops today.

### *How do people find things?*

An informal user study was conducted to provide insight into designing useful file representations for computer systems.



Figure 2: Distinctive shapes, sizes, colors, and markings help us recognize real objects.

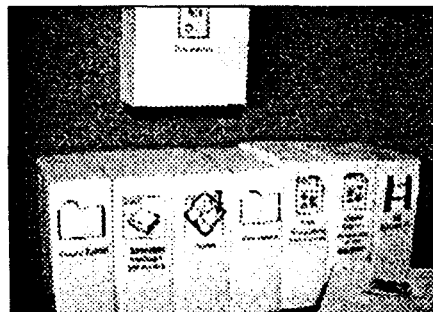


Figure 3: If real objects look like computer files it's much harder to distinguish them.

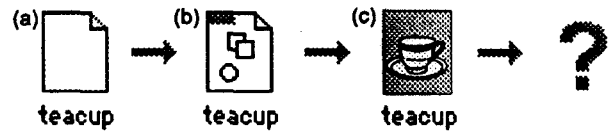


Figure 1: (a) a generic document icon. (b) reflects the application used to create the file. (c) the icon represents the file's contents.

The study aimed to identify the visual cues that help people recognize real world items. Five subjects carried tape recorders for three days and recorded their process whenever they needed to find something. While searching for an item, subjects described what they recalled about it, how they went about looking for it, and how they knew when they had found it.

Their processes were characterized by trial and error searching amongst various possibilities. People often failed to accurately recall the characteristics of items they sought. They also made mistakes when specifying the item's location, or when describing appearance details. Even so – once they saw a desired item – they recognized the details, such as specific words, colors, typography or images. Sometimes a particularly distinctive item – such as a large brightly colored book cover – was used as a kind of "landmark," near which less distinct items were thought to be located.

The user study findings led to the development of two new representation ideas for documents on a computer desktop: meaningful containers and flexible views. A description of these representations and examples are provided below.

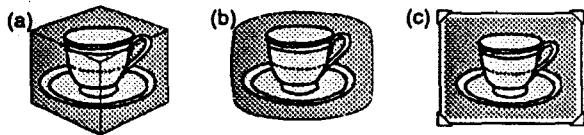
### **Meaningful Containers**

Knowing what type of medium information is carried in often helps us find and recognize it. When looking for a book, for instance, we ignore other media types such as cassette tapes, transparencies, and pencils that might be encountered while searching. Having learned that books are made of bound paper and a cover, we can search for a particular book efficiently by examining only books. We further refine our searches for objects by knowing something of their sizes in relation to one another. When looking for a paperback, for instance, we tend to ignore large coffee table books.

### *Distinguishing media-types*

Recently, many personal computer systems have introduced new data types such as movies and three dimensional objects.

However, in many cases, these new data types are constructed and placed within two dimensional documents (even though these new data types possess temporal or higher dimensional spatial components). If content proxies are created for these documents, they may not be readily understood. How is a user to distinguish whether a pictorial icon represents a document containing a still image of an object, a movie that includes the image as one frame, or an interactive 3-D representation? For example, the teacup representa-



**Figure 4: Meaningful containers.** (a) indicates the cup is a 3-D model, (b) indicates the cup is a frame within an animation through its TV screen shape, (c) indicates the cup is a bitmapped image.

tion in Fig. 1c is ambiguous. The teacup might be a 3-D model or it might be a bitmapped image. This problem can be resolved by introducing a *meaningful containers* representation. As shown in Fig. 4, when the teacup appears within a container that represents its data type, the ambiguity is resolved.

#### Preserving a sense of scale

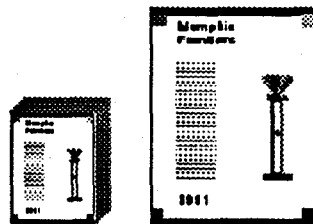
In addition to representing data types, we can better convey relative scales of items. On today's systems, all icons are the same size, regardless of the actual size of the file's contents. For example, a 200 page, 8 1/2" by 11", report and a 20" x 24" poster are both represented by the same size icon. Fig. 5 shows how we might represent their relative sizes more appropriately.

#### Flexible Views

From the study, we noted that no single representation of an item is sufficient – users representational needs changed with their current context and personal idiosyncrasies. Attributes recalled vary widely. Consequently, no single icon representation can be deemed best for everyone. Let's take a specific example: two people want to look for a report written some time ago and they've each narrowed down their search to 30 documents. The illustrator of the report might find it again by viewing proxy icons that emphasize the illustrations within each of the 30 documents. Alternatively, the report's writer might benefit from icons that represent the title and layout of the opening pages of each report.

#### Selective emphasis

One solution is to provide a viewing bias that supports browsing of specific criteria by users. For instance, users could select to view icons by specific data types – effectively requesting the system to “show me all pictures in this set of files,” or “show me all movies within these documents.” The viewing cone, introduced by Mander, Salomon, and Wong [1] for browsing piles, provides a means of supporting this *selective emphasis* browsing. In their design, the user rolls the mouse over a pile and a content proxy (visual miniature) for the document directly under the mouse appears in the viewing cone. Instead of showing visual miniatures for each item, the user might benefit from being able to request that the viewing



**Figure 5: Preserving a sense of scale.** The proxy on the left depicts a multiple page, standard size, document, while the one on the right represents a large-sized poster.

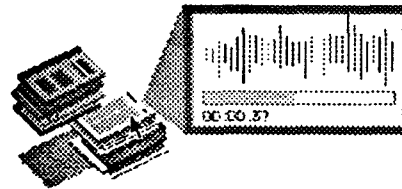
cone only show “audio clips.” Then, while rolling the mouse over the pile, only those documents containing audio clips would reveal their contents in the cone (for those not containing audio, the cone would not appear). As shown in Fig. 6, audio exists in the document under the mouse and the first audio clip within that document is shown. As described in the general pile browsing scheme, the arrow keys on the keyboard could be used to flip to previous or subsequent audio clips within the same document. Furthermore, an audio clip might initiate playing while visible in the cone, and stop when the user moves to another clip, or when the cursor moves beyond the specific document.

The concept of viewing by selective emphasis can be applied to non-piled documents, as well, through the use of a small overlay window. This overlay window appears “above” the proxies of those documents that contain data of a specific type. For example, by selecting a viewing emphasis of “bit mapped images,” a user could reveal all documents which contain images at once (Fig. 7).

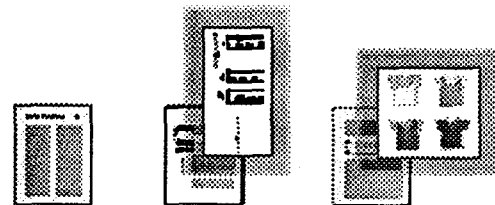
#### Conclusions

End users are creating and managing substantially more data on their computer systems today. Some tools for helping users locate items within file systems have been introduced, but in many cases, users are still faced with the task of looking among many files to find a desired item. Richer file representations, that facilitate recognition based on varying criteria, may aid in this browsing task.

By studying how users find things in the physical world, we were able to derive a number of different representations that are appropriate for the computer desktop. For the most part, the representations proposed help users recognize items they have seen before. Additional representations may be required to help users select desired items from collections that are not familiar.



**Figure 6: Browsing with a “sound note” emphasis.** As a user rolls their cursor over the pile of document proxies—only those containing sounds reveal the viewing cone and play the sound.



**Figure 7: Browsing with a “bitmapped image” emphasis.** When the image emphasis is selected by the user, all proxies representing documents which contain images reveal the first image in an overlay viewing window.

#### References:

- [1] Mander, R., Salomon, G., and Wong, Y. A 'Pile' Metaphor for Supporting Casual Organization of Information. *Proceedings of CHI'92 Human Factors in Computing Systems*. ACM Press, pp.627-634.
- [2] Moore, R., Morrison, J. and Oren, T. Proxies and Their Applications. *Apple Viewpoints*. July 10, 1989. Apple Computer, Inc.