Human-Computer Interaction Through Improving Navigation-based File Retrieval

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***Abstract*:- Interaction is the central category of Human-Computer Interaction (HCI) research area.**
The main purpose of HCI is to make interaction with computer systems usable.
Navigating through a file hierarchy is one of the most common methods for accessing files, yet it can be slow and repetitive.
New algorithms that predict upcoming file accesses have the potential to improve navigation-based file retrieval, but it is unknown how best to present their predictions to users.
We present three design goals aiming to improve navigation based file retrieval interfaces: minimize the time spent at each hierarchical level on route to the target file; provide shortcuts to reduce the number of levels traversed; and promote rehearsal of the retrieval mechanics to facilitate expertise.
Three interfaces that augment standard file browsers based on each of these goals: Icon Highlights give greater prominence to predicted items in the current folder; Hover Menus provide shortcuts to predicted folder content; and Search Directed Navigation uses predictive highlighting to guide users through the hierarchy in response to query terms.

INTRODUCTION

Human-computer interaction (HCI) is not only an interdisciplinary field. It is also research and practice area. Most of researchers and practitioners of the HCI tend to be non-academic actors, but they unavoidably face theoretical problems in their researches. The main reason is that there is a great pragmatic bias and orientation on practical results. Nevertheless, every particular research or practice is still embedded in a specific theory, whether authors are aware of it or not.

Retrieving files is an extremely common task for all computer users. Of the many interfaces that are possible for retrieving files, navigating through a hierarchy using a file browser is dominant (used more than 60% of the time, according to previous studies [3]).

However, file browser navigation is slow – more than 12 seconds per retrieval for Mac users and more than 17 seconds for Windows users [3]. This is a long time to retrieve a file, given that selecting a ready-to-hand file icon would take no more than a second or so. There are two main reasons for these long completion times: users may not know where the file is stored, so that, it can take a couple of time to explore the file system; and there are numerous navigation actions required (remembering folder names, finding icons in the current display, and clicking folders to open them). It is clear that whatever it is the cause, reducing retrieval time for hierarchical file browsers could result in large aggregate time savings.

The general problem of improving file retrieval has conducted to substantial attention in research. There are several aspects of the problem which have been studied by the researchers:

how users choose to organize information [10, 2], the performance implications of different hierarchical structures [8], potential improvements to file access using search [5], visualizations that provide shortcut access to files [12], and predictive algorithms for anticipating retrievals [6].

So that, to solve the performance problems of file retrieval, it is necessarily based on improvements that are able to work with the presentation styles and interaction models of the standard hierarchical file browser. In this paper, three new techniques based on design goals for overcoming three performance constraints in navigation-based retrieval are presented:

1. Overcome the *visual search* constraint: minimize the time spent at each hierarchical level, by reducing exploration and visual search;
2. Overcome the *levels* constraint: reduce the number of levels traversed, by facilitating shortcuts;
3. Overcome the *practice* constraint: improve navigation expertise, by promoting rehearsal of the retrieval mechanics.

These techniques address these constraints using some of the same advances seen for prediction-based and search-based approaches, but the difference resides dramatically in the way that the algorithms' results are presented to the user and the way that the user interacts with the new capabilities. Results are tightly integrated into the interface and interaction paradigm of the file browser in our techniques.

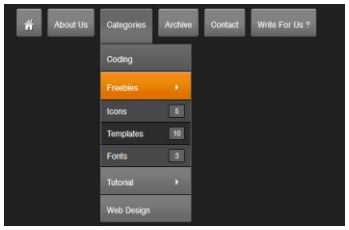

Fig1: Hover Menu

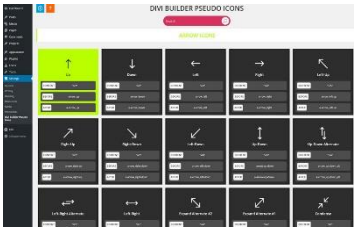

Fig2: Icon Highlights

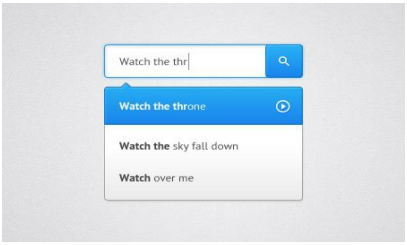

Fig3: Search Directed Navigation

To reduce step times during file navigation (approach 1), *Icon Highlights* (Fig1) predict which items in the current folder are most likely to be accessed, and give them greater visual prominence.

Hover Menus (Fig2) provide quick access to commonly accessed items inside folders, in order to reduce the number of steps required in many cases (approach 2). *Search Directed Navigation* (Fig 3) guides users through a file hierarchy based on a filename query. This is designed to bring some of the advantages of search to file navigation, while facilitating the development of expertise when compared to search (approach 3).

Connected work

There is vast prior literature on file retrieval. The following sections briefly reveal key contributions on how users organize and retrieve files, the impact of structure, and interfaces for file retrieval.

✓ *Organization and retrieval of files by users*

To perform successfully the retrieval of a file using navigation, users must remember where that file is located. This is due using of method of recall or recognition of the file name.

✓ *The performance impact of structure*

The influence of hierarchical structure on navigation time has been extensively researched, and is broadly encapsulated by the question 'broad and shallow or narrow and deep?' [10, 7]. Two authors Cockburn and Gutwin [4] provide a review of thirty years of empirical research on the topic, which shows diverse results. Numerous studies show that plots of navigation time against depth follow a 'U-shape', whereas others show that time increases depending upon depth and they also demonstrate a simple mathematical performance model which is called 'Search/Decision and Pointing' (SDP).

This explains the result's diversity: broadly, a U-shape occurs if users must visually search for items at each level of the hierarchy, while shallow structures perform best when users can anticipate target location at each level.

SDP predicts the time taken to select an item at one level of a hierarchy by combining three factors: the time to visually *search* for the target; the time to *decide* about target location; and the time to *point* to it.

✓ *File search and enhanced interfaces*

Particularly, when item locations are unknown, users go through an essential tool called 'search' to access files. This tool has many attractive features for file retrieval: any file attribute can be searched, rather than requiring memory of the item's location [9]; it does not depend on a hierarchy, relieving users from the need to develop semantic groupings before storage and assign files to them; and it enables retrieval in a single step [1], potentially allowing for significantly faster retrievals.

IMPROVED FILE NAVIGATION: GOALS AND INTERFACES

There are several opportunities for improving human performance in navigation-based file access. We are going to extract these opportunities into three design goals, and then present three interfaces aiming to satisfy the goals. It is important to note that any file retrieval mechanism will have three parts: an underlying algorithm for deciding which items to present, a presentation approach for making items visible and salient, and a set of interaction techniques with which the user can use to achieve his targets.

DESIGN GOALS

In this section, we focus on the 'Search Decision and Pointing' model [2] which predicts hierarchical navigation time based on the time taken at each hierarchical level ('step duration'), the number of levels traversed ('step count'), and the potential for the user to make a transition from novice to expert behavior. The goals are the followings:

1. *Minimize time spent at each hierarchical level:* The techniques of improving human performance in a searching for targets, deciding about them, and pointing to them are possibilities suggested by the SDP to reduce step duration.
2. *Provide shortcuts to reduce levels traversed:* The SDP model also suggests that efficiency gains can be achieved by reducing the number of hierarchical levels traversed on route to the target.
3. *Promote rehearsal to facilitate expertise*: Kurtenbach [7] argues that expert performance is best facilitated when the actions that a novice uses for an interaction are a physical rehearsal of the mechanisms used when expert. Goal 3 adapts Kurtenbach's recommendation for file retrieval

FILE NAVIGATION INTERFACES

As described above, each technique can have an underlying algorithm, a presentation approach, and various interaction techniques.

Icon Highlights: minimizing search time:
Icon Highlights increase the visual salience of items that Access Rank predicts.

Hover Menus: provide shortcuts across levels:
Hover Menus are designed to give users shortcuts to predicted targets located deeper in the hierarchy.

Search Directed Navigation:
Search Directed Navigation (SDN) is expected to satisfy Goal 3 by providing search-based guidance through the navigation hierarchy towards the target and allowing the user's interaction with search results to be a rehearsal of navigation-based retrieval.

CONCLUSION

In this paper, three interface designs had been presented and explained on how user can improve the performance of file access by navigating through hierarchical structures. The designs use some algorithms or search term queries to predict likely target files. The interfaces are designed to *assist* with hierarchical traversal, rather than simply deliver a list of likely targets, because they are expected to help users to access to the location of files. The ***Icon Highlights interface*** is designed to help users in visually identifying likely targets at each level of the hierarchy. The ***Hover Menus interface*** is designed to facilitate shortcuts to likely folders and files across levels of the hierarchy. Search Directed Navigation highlights items that match search query terms, emphasising those also predicted as more probable. It offers an alternative to search by guiding users through the hierarchy to matching items.
For to close, let say that all of the interfaces allow faster task completion than the standard file browser in all conditions, and subjective preference favored them.

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