Pilot Study

Introduction

This chapter presents a description of a pilot study that was carried out in order to test the usability and potential effectiveness of a paths facility in aiding navigation. The experimental setup and results are presented, and these are examined to identify any significant features that require further study, especially differences between experienced and novice users. The apparent importance of meta-information (of which scope information is one part) is described, and the possible value of the paths mechanism is discussed.

Aims of this Study

The aims of this study were:

— to see whether a path mechanism can help users navigate a large hypertext system;

— To see if novice users find a path mechanism more helpful than experienced users;

— to see which users prefer a path-based system for navigation;

— to test the usability of a path tool;

— to see if there are observable differences between groups on experience versus correctness;

— to see if there are observable differences between groups on usability over correctness;

— to observe interesting features of use;

— to identify other possible trends;

Some of the initial thoughts were that:

— a path mechanism would assist navigation in a large hypertext system;

— naive users would navigate better with a path tool than with using HyperCard commands available to them, due to a reduced learning curve and reduced cognitive load;

— expert users would explore more — that is, they would go off the path more;

— meta-information would prove helpful through providing contextual assistance, perspective and guidance;

— a path would be a useful facility in a learning environment because there is a recognised expert who can create a path through pre-existing material that the user can easily follow;

— a path facility would also be useful for saving paths when searching through existing materials.

Method

Twelve subjects were assigned to two groups with six in each group. Each group had the same information base to explore. One group used a home card as a base for navigation while the other group used the path facility. Their task was to find out what they could about owls, as well as general bird characteristics, specifically feather anatomy, surface characteristics, and flight. The path group had a path about Owls and bird characteristics made up for them while the Home group had to use HyperCard's facilities as well as the embedded facilities in each stack to find what they could. Materials introducing navigation in HyperCard as well as the concept of a guided path were given to the subjects for study beforehand. These can be seen in the Appendices. The Path group could, of course, also use HyperCard's facilities and the embedded navigational controls in each stack, if they wished.

The information base consisted of six stacks that were 'real-life' stacks. That is, they were not specifically created for this pilot study and were selected for providing some degree of realism in interface and content differentiation. They had varying degrees of value in relation to the task that was set. A breakdown of their contents can be seen in Table 6.1.

Stack Name	Number of Cards
Aesop's Fables	348
Animals	3
Bird Anatomy	47
Bird Stack	45
Dinosaurs	42
Rocky Shore Discovery	137

Table 6.1 *Contents of the Information Base*

The Owls guided path consisted of 14 cards selected from two of the stacks. The path contents can be seen in Section 12 of the Appendices. Note that

the nodes on the path did not contain all the information that was required to correctly answer the comprehension questionnaire.

Each group had 30 minutes to explore the system and find out as much as they could. No note taking was allowed. At the end of the 30 minutes, all the reference sheets were collected in and questionnaires were handed out. The paths group had to fill out a subjective evaluation on the usability of the path, including questions about path navigation and their understanding of the palette functions. Both groups filled out a subjective evaluation on the usability of the system — mainly about HyperCard's navigational facilities and the embedded facilities in the stacks. Both groups also answered a multiple choice comprehension questionnaire on the task — on the subjects of Owls, feather anatomy, flight and other characteristics. This was aimed at testing the amount of relevant material that was covered.

Subjects were also encouraged to provide additional comments about the system that they used, and these were written at the end of each questionnaire.

Results

In collating the results, some of the aims are:

1. See if there is any perceived difference between the groups when comparing experience of use vs correctness in comprehension.

2. See differences in subjective evaluations of paths and overall between experienced and novice, and over groups.

3. Identify trends, if possible.

4. Pick out interesting features.

Comprehension results

There were 13 questions in the comprehension exercise. Scores ranged from 2 (1 novice, Home group) to 12 (2 subjects: 1 novice and 1 expert, both in the path group). Ranges within groups were:

	Novice	**Expert**
Home	2	11
Path	5	12

Table 6.2. *Range of Comprehension Scores*

Experience versus comprehension

Overall, the scores for the group that followed the path are higher than the group that used the home stack. This is not particularly interesting as that is what was expected, since the comprehension questions were aimed at the material that should be covered in the path.

However, previous computing experience seemed to have a greater impact on the scores of the Home group than it did on the Path group. There seemed to be a trend in experience versus correctness for the Home group. Users with greater computing experience did better than users with less computing experience. This was also the case for the Path group but their results in the

comprehension questionnaire seemed to be less affected by their previous computing experience. In fact, one very inexperienced subject did as well as anybody on the comprehension exercise.

One subject in the home group had little computing experience but did very well in the comprehension questions, but this can be explained by their previous knowledge on the topics of owls and bird physiology.

Usability Questionnaire

Subjective Evaluation of System Usability

The subjective usability questionnaire aimed to gauge the users' feelings about the operation of the system and their confidence in navigating the system. It was also intended to provide a comparison between how a subject felt about their use of the system and how they scored on the comprehension exercise.

Feeling Lost

There didn't seem to be much difference in feelings of being 'lost' in the system. Expert users in both groups expressed fewer feelings of being lost than did novice users. Novice users in the path group still felt lost to begin with, but most indicated that after some experimentation at the start, they didn't feel lost from then on. The feelings of being lost were reflected in the comprehension scores — the subjects who felt more lost scored lower than those who didn't feel so lost.

All relevant information found

This question resulted in great confidence in the path group that they had seen all relevant information. Four out of six said they had definitely seen all there was in the system about Owls. This was usually reflected in the comprehension score although one novice subject scored poorly after expressing confidence that they had seen all the relevant information.

Subjects in the Home group expressed less confidence that they had found all the relevant information than those in the path group. Novices had less confidence than experienced users, as the expert users tended to exhaustively search the system for relevant information.

Confusion

Subjects in the Path group were less confused with what to do next. Again, the experienced subjects in both groups were less confused than the novices, but the between group comparison indicates that the Path group overall had fewer problems in deciding what to do next.

Card Navigational Facilities

There didn't seem to be a difference between the groups in understanding card navigational facilities, but there was between experienced and novice users. Novice users had more difficulty understanding the navigational facilities on each card.

Information

In both groups novice users were more likely to want extra information about what they could do on a card. There didn't seem to be any particular difference between the groups.

Confusing Controls

Subjects in the Path group found the controls more confusing than subjects in the Home group. In the Home group, experts found the controls less confusing than novices, while this was not noticeable in the Paths group.

Interaction Style

Half the subjects, evenly distributed between experienced and novice users, rated voice interaction as their preferred interaction style. Whether this is due to the novelty of voice interaction is unclear. Most users who knew what a floating palette was stated that it was good to use as it presented a consistent set of tools (to paraphrase one of the subjects' comments).

Novice users in the Home group didn't know what a palette was and so couldn't evaluate it. They usually rated menus and HyperCard's facilities as preferred interaction facilities, but this can probably be explained by their lack of knowledge about other interaction styles.

Interestingly, only one user (an expert in the Home group) thought that commands typed at a keyboard would be reasonable to use, although his

preferred style was voice interaction, and another preference was a floating palette.

Other interaction styles that were suggested by users were gestural commands and a light pen. An experienced subject in the Path group suggested a gestural interface. Gestures could easily indicate 'Go to Next in Path' and 'Go to Previous in Path' with gestures right and left, for example. A jump back to the path might be indicated by a gesture up. Indicating the need for meta-information might be more problematic.

A novice user in the Home group suggested a light pen interface, and this might be because of their desire to find out where invisible buttons were quickly and easily. The user was not unfamiliar with using a mouse, so a more direct method of interaction, such as a light pen or touch screen, might be useful for some users.

Path Usability

The path usability questionnaire was designed to get the users' subjective evaluations of the usefulness of the path facility, an idea of how they used it, and whether they understood the path palette controls. It was also intended to provide some comparison between how a subject felt about using the path and how they scored on the comprehension exercise.

Path Coverage

All except one expert subject covered the whole path. The exception was a subject who felt more confident in his own ability to find the relevant information than in the path's ability to guide him.

Meta-information

All subjects, except for the one expert subject mentioned above, used the meta-information button on the path palette. Some used it all the time, while others only used it occasionally. There didn't seem to be a marked difference between expert and novice usage. However, novice users found the meta-information to be very useful while expert users found it to be of less value.

Path Following

All subjects went off the path on side-trips very often and they also found it very easy to get back on the path.

Palette use

Most subjects understood the functions of the path palette controls, although the novice users had more difficulty than the expert users. All subjects found the palette easy to use and liked using it. Two users (one novice and one expert) indicated a preference for using HyperCard's navigation facilities rather than the palette. This may be due to the increase in functionality offered by HyperCard's facilities.

Discussion

This section analyses possible reasons behind perceived trends and interesting features that were observed in the results of the study. An obvious trend is that experienced subjects had fewer navigational problems overall than novice subjects. This is to be expected and is not particularly interesting. Other trends and features are discussed below.

Feeling Lost

It is interesting that users in both groups expressed similar feelings of being lost. The path group was expected to be less lost due to the stabilising structure of the path — the nodes on the path would correspond to landmarks that the user could easily return to. In comments afterwards, several of the subjects in the path group expressed their desire for further information about the path. The main requests were that the palette provide three extra items of information: the name of the path currently open, the length of the path and the position of the current node in relation to the length. These appear to be needed to provide to the user an indication of the scope of the path and their position in it. This would enable them to better evaluate the path when they are under constraints, such as time, as was the case in this study.

The constraint of time and the lack of path scope information resulted in one experienced subject following the path very little. He still scored well on the comprehension exercise, however, and this can be attributed to his prior computing experience. As previously stated, he expressed more confidence in his own ability to find the information than he did in the path to guide him to it.

I believe that slight modification to the palette would provide better contextual information and so decrease the feelings of being lost for the path group. This should be tested further, however.

All relevant information

It was interesting that the path group expressed a great deal of confidence that they had seen all relevant information in the system. It was most interesting because, for the most part, the path didn't provide all of it. This confidence has implications for the way that subjects explored. From observation, only the expert subjects were likely to effectively use HyperCard's facilities to find

relevant information. Most subjects used the embedded facilities to explore, which in a large system is likely to be ineffective. Subjects in the path group had a better basis for exploration, in the fact that related material was located in proximity to nodes on the path. So exploration of the immediate surroundings was likely to be more rewarding for the path group than for the home group. This is an indication that a well-designed path can be used as a guide and is preferable to free exploration, especially for inexperienced users who often have to try and understand the 'system' rather than concentrating on the content contained within the system. The path facility can provide a simple yet effective guide to areas within the system.

Meta-information

Novices wanted more information about what they could do at any stage. This illustrates one of the reasons behind a meta-information function. The meta-information button on the path palette can provide information for the current context (i.e. the current node) that can be used for a variety of purposes. Novice users needed more information about such things as the function of the embedded facilities in a particular stack. This could be provided whenever the path runs into a new stack that has some significantly different controls. When new controls are presented an experienced user is more likely to experiment and be able to understand each function based on their experience, while a novice will be less likely to ascertain the functions correctly without some guidance. The effort that any user puts into experimentation in order to understand the controls increases their cognitive overheads which detracts their attention and processing power away from the subject matter.

The path group used the meta-information very often and the novices found it to be very useful. So this indicates that it is a useful function in addition to the actual content of the nodes.

Conclusions

The main conclusions that can be taken from this study are:

1. That inexperienced users need help more than experienced users, and the path tool can be useful in providing this.

2. That meta-information is seen as valuable by users. This includes scope information that can provide extra medium-scale contextual help.

3. That a path facility may be a useful aid for navigating complex systems, because it can provide an expert's guidance through the system as well as providing extra information such as the author's point of view.

4. A simple and consistent path control device (such as the path palette) is useful because it provides a simplified and consistent interface which is valuable for inexperienced users.

Further Investigation

This was a pilot study into the effectiveness of a path facility for navigating complex systems. As such it should be treated as a trial, with the results only perhaps a guide for further investigation. Here are a number of items that warrant further investigation after this study:

1. How effective is scope information in aiding navigation? This could be tested by having two groups using paths, but one using a modified version of the palette that shows the name of the path, its length, and the current position in the path. This might result in a reduced sense of being 'lost' compared with the current study.

2. How effective is meta-information? This might be tested using the paths facility with one group having meta-information available and one group not having it. Of course, the relative effectiveness of the meta-information is a result of what is contained in it and how it relates to the content contained in the path. The quality of meta-information could perhaps be evaluated as to its effect on subject's performance, both in comprehension and in subjective usability.

3. How can link markers be effectively provided within HyperCard so that 'invisible' buttons may be readily apparent as links? To test this two groups could be used. One group navigates a system that contains invisible buttons while the other group navigates the same system, but with some sort of link marker indicating the link location and link extent. To do this a mechanism that would record all mouse selection actions would be required, so that the work involved in finding links could be evaluated.

4. What effect does prior experience with the Paths facility have on performance when it is used again? Is the concept of a separate structure overlaid on top of HyperCard simple to remember? What effect does previous use have on the amount of exploration?

5. Can people use the authoring component effectively, and how does authoring a path affect comprehension? This could be examined by using two groups. One group uses a path that has been made up for them on a topic, while another must make their own path up on the same topic. Comprehension could

then be tested for each group. Evaluation of the created paths compared to comprehension could also be carried out.

These are interesting questions that require further investigation to ascertain the possible use and value of a path facility to many users.