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**A Basis for the Exploration
of Hypermedia Systems:
A Guided Path Facility**

A thesis presented
in partial fulfillment of the requirements
for the degree of Master of Arts
at Massey University

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1992

Abstract

This thesis examines the potential of a paths facility as an aid to navigating large hypermedia systems. The use of the navigational metaphor as applied to finding information is continued with the idea of following a path through information 'space'. This idea assumes that each node, or chunk of information, on the path can be considered a landmark that can be easily returned to when side-trips are taken off the path to explore the surrounding space.

The idea of a guided path assumes the re-use of a path, and also assumes that there is extra information available about the path. This meta-information is very important for providing information to help path-followers make better sense of the path, both in terms of content and context, but also in making more effective use of the nodes on the path and in navigating the variety of interface conventions seen in the test environment — HyperCard.

A small pilot study has been carried out using two groups of users performing a directed information-seeking task. One group used HyperCard's navigational facilities to find information in a group of stacks, while the other group used a guided path as a base on which to explore the same group of stacks. Both groups had a time limit, at the end of which they completed a number of questionnaires to indicate task completion, as well as providing a subjective evaluation of the facilities they used.

The guided path facility appears to be most effective for inexperienced users for a number of reasons. It presents a simplified view of the complex system — the information available has already been filtered and selected, and a simple and consistent navigational interface reduces the cognitive overheads associated with learning a variety of mechanisms present in different stacks.

An important feature of a path facility seems to be the provision of meta-information, especially scope information which can reduce the incidences of disorientation. Another feature is the provision of a history facility which provides a backtracking capability. It may also be used in the creation of paths using the length of visit as a criterion for node inclusion on a new path.

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Acknowledgements

I gratefully acknowledge the advice and assistance of my supervisor, Professor Mark Apperley, without whose guidance this thesis may never have been completed. A constructive proof-reader was my father who corrected my bad grammar and was always keen to discuss the ideas contained within the thesis. Thanks are also due to the Brenden, Philip, and Colin for their assistance, and the rest of the Department for the use of their facilities. Despite all this help, I am sure that some mistakes will inevitably creep through. Any remaining errors are my sole responsibility.

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Introduction

Technological advances, as well as economic and environmental concerns, have resulted in the possibility of, and the demand for, electronic publishing. In order to make the published materials more effective for users (and more enticing to them), multiple media are being used to enhance the products. Hypertext-style systems are becoming more widely used in these products because they offer a great deal of flexibility — multiple ways of navigating a system mean that many different meanings can be taken from the same set of materials. Thus many users can, if so desired, access similar materials in different manners and in different sequences, and thus personalise their information paths, depending on their interests and preferred methods of interaction. The addition of multiple media has produced hypermedia systems that can link not only text to other text, but they can also link each medium to another. So we may have links from video to text, or audio to graphics. Thus the scope of these systems has increased greatly, as has their complexity.

Navigation Problems

This increase in complexity results in many problems, not only for the authors who must decide on what information should be linked to what, and in what format it should appear, but also for the readers of the finished documents who must first of all decipher what is linked and what isn't, and then decide on which links to follow. Without the cues that are used for navigating within traditional information sources such as books and libraries, the facilities provided in the systems and by the authors must be used to find the information required.

As the amount of information within these hypermedia systems increases, the problems that are faced in finding particular items of information increase as well. Following links from one chunk of information to another can rapidly result in a user becoming disoriented or lost. This means there is a need for

mechanisms to reduce the occurrences of disorientation, and also for aids that can help a user to overcome the problem when it does occur.

In addition to the increase in complexity of the systems, another factor that can greatly affect the effective use of hypermedia systems is the amount of experience of the users. Experienced users can be expected to have fewer problems in utilising a system efficiently. Inexperienced or novice users would be expected to have more problems, not only in using the system controls, but also in understanding the structures within the system, or how the linked items relate to one another.—

Every hypermedia system contains a variety of mechanisms to aid users in their information navigation tasks. Often these aids will be in the form of a graphical browser or map, a table of contents or overview, an index, a search facility, some sort of ‘history’ or go-back function, as well as the obvious follow-a-link mechanism. These facilities are reasonably effective for small- and medium-scale systems. When the size of the system increases, these facilities in turn become more difficult to use.

One method of reducing the system complexity is to provide some sort of filter that can simplify the view of the structures that need to be navigated. This filtering may be automatic, in the form of an intelligent agent, or it might be manual, in the form of a guided path. The resulting view contains information that is deemed relevant in some way to the information-seeker’s needs.

However, for novice users, the act of specifying a filter, or knowing what to filter, is itself difficult without a good idea of the structure of the system or the subject area. So knowing what to filter out becomes very hard without this prior knowledge. Even if we assume that a filter is provided for a novice user, the cognitive overheads involved in actually trying to navigate the structure can detract from understanding the information contained in the system. A novice user may not understand the screen layout or the navigational controls.

A Path Mechanism

This means that additional methods of providing system simplification may be required. In addition to making the structure of the system easier to understand and to navigate, the actual interface may need to be simplified so that novice users can still navigate effectively with a reduced set of commands. This

implies that the path can be navigated with a reduced number of controls, and as a path is basically linear then the primary controls are a step forward and a step back. Interface simplification also implies explaining screen layout conventions and navigational controls that are used in each card or stack on the path. So this means there is a requirement for some extra information supplied by the path author. This extra or meta-information can explain what's contained in the path, the interface conventions at each card on the path, noteworthy points, or it might provide supplementary information about the path topic. It might also be used by a path-follower to note down thoughts as they occur in the context that they occur. Thus a way to add or display this meta-information is needed in addition to the simplified navigational controls.

Thesis Proposal

This thesis proposes that a guided paths facility would be a useful addition to the navigational aids provided in hypermedia systems. It would be valuable to inexperienced users because it can present a simplified view of a large and complex hypermedia system. It also provides a simplified set of navigational controls that eases the cognitive load associated with understanding what different controls and conventions do in multiple stacks. In addition, a guided path actually 'guides' a path-follower to interesting information, not only through the actual contents of the path but also through the use of meta-information that provides context, pointers to interesting items, narrative point-of-view, and explanation about interface conventions.

These characteristics of a guided path mean that not only experienced users may navigate effectively through a large, complex, and unknown hypermedia system, but inexperienced or novice users may also tour the system and, in so doing, may gain experience that may enable them to later explore it in a more flexible manner. It also enables users to save a particular path through a complex system so that they may re-find their way to particular information at a later date.

Pilot Study

In order to better evaluate the possible use and effectiveness of a guided path facility, a pilot study was carried out. Some of the questions that the pilot study aimed at investigating were:

- Would a path mechanism assist navigation in a large hypertext system, especially for inexperienced users?
- Would naive users navigate better with a path tool than with using HyperCard commands available to them, perhaps due to a reduced learning curve and reduced cognitive load?
- Would expert users explore more — that is, would they go off the path more?
- Would meta-information be helpful through providing contextual assistance, perspective and guidance?

Another aim of the pilot study was to discover what other questions about path mechanisms and general hypermedia system navigation would be worth investigating further.

The pilot study was carried out using HyperCard as the test system. HyperCard is very widely used and a path facility may be valuable in enabling more users to access the increasing amount of materials that are appearing in this system. A path mechanism was designed and built that provided an easy method of creating a path, storing and manipulating paths, and following a path. This mechanism provided two interfaces — one for path creation and one for following a path. This was intended to distinguish experienced users, who would create their own paths and paths for other people, from inexperienced users who would be path followers and would therefore require a simpler interface i.e. they would need less controls because they require less functionality.

Thesis Description

Chapter One offers a general discussion of hypermedia, comprising of a general definition of Hypermedia, followed by a discussion of the origins of hypertext concepts and systems. Next is a short presentation of a number of common hypermedia systems and some of their characteristics.

In Chapter two, navigation and orientation in hypermedia systems are discussed. Firstly, metaphors in the interface are discussed and then the application of the geographical metaphor to navigating hypertext systems (or information '*space*') is explained through various geographical metaphors used in a number of systems. Then the navigational capabilities of various hypermedia systems are presented at three levels — large scale, medium scale,

and small scale — as the tools and techniques that are used in finding information differ at these levels.

Chapter Three breaks down the tools that are used for navigating hypermedia systems into specific discussions of their use and utility, with detailed examples from specific systems being presented. The main tools and techniques discussed are Paths and Tours, Maps, Guides and Agents.

In Chapter Four a trail-blazing facility is presented. It begins with a discussion of navigation in HyperCard and follows with a description of the navigational problems that the trail-blazing facility alleviates. Following this is a description of some of the specific mechanisms that the facility uses to help reduce navigation and orientation problems in large hypermedia systems — or more specifically, in large groups of HyperCard stacks. This includes the use of a simple interface and the provision of meta-information.

Chapter Five presents the implementation details of the trail-blazing facility. It explains the structures used, screen layouts, and problems and limitations of it.

Chapter Six presents the Pilot Study that was used to evaluate the trail-blazing facility. Conclusions and further questions are discussed.

In Chapter Seven some overall conclusions about paths as aids in navigation of hypermedia systems are presented. Then it provides some ideas for future enhancement of the trail-blazing facility, as well as some ideas for further research into this area of navigation in Hypermedia systems.

Lastly, the appendices provide details of the pilot study: the HyperCard stacks used, demographic and evaluation questionnaires, a description of how to actually use the Guided Path facility, a program listing, screen dumps of each of the cards that were used in the test path in the pilot study, and finally, the references used in this thesis.