

Exploring Web Exploration: An Empirical Study

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Abstract

The World Wide Web provides a wealth of resources, and coupled with its structure, creates a unique exploratory environment that is quite different to conventional applications. In this paper we present a refinement of exploration for the web, based on the analysis of observations and interviews of end user's exploring web sites. This refinement is necessary to support our future research where we intend to model user's exploration.

Keywords

Exploratory Behaviour, Human Navigation Method, World Wide Web.

INTRODUCTION

The World Wide Web provides a wealth of resources, and coupled with its structure, creates a unique exploratory environment that is quite different to conventional applications. Our long term research aim is to develop a formalism that allows web designers to model user's exploration. This model will provide designers with an understanding of the user's exploration process throughout the defined tasks and the possible deviations that occur from those tasks.

In order to succeed with the above research aim, we need to build a strong understanding of exploratory behaviour performed by users. Therefore, our first step was to validate, within the web context, the definitions of exploration found in the literature. This paper reports on this first step.

After surveying the literature, we adopted an experimental research approach, including observations of web exploration performed by users and face-to-face interviews. From these observations and interviews, we refined the definition of exploration for the web; this short paper reports these preliminary findings.

WWW AND EXPLORATION

Site structures and navigational aids play an important role in enabling the user to explore adequately through the World Wide Web space. Exploratory behaviour in computational systems varies depending on the type of system the user is exploring. A substantial amount of research has been performed within traditional application, game and also web contexts. The observation of user's exploration in these studies has provided several key behavioural findings. The findings have included several conclusions based on task formation (Soto 1999), user's approach to randomly trying things (Soto 1999), remembrance of commands and surroundings (Soto 1999), frustration (Rieman 1997) and navigation methods such as landmark, routes or maps play (Whitaker 1997).

Navigating methods

Navigation plays an important role in enhancing exploration, as highlighted by Hammond (1993). Many authors discussed the psychological aspects of navigation on the basis of three methods which people use to navigate towards a goal [Dillion *et al.* (1993), Raskin (2001), Boling (2003) or Whitaker (1997):

- Landmarks: a landmark is an identifiable feature of a general landscape and is used as a base. In the web context the website is the landscape, and its symbols, navigational screens, graphics or bookmarks are its identifiable features.
- Route: a route is a path to get from one place to another. In the web environment a route is simply defined as a logical set of links that form path between navigational pages.
- Map: a map represents a spatial orientation and the relationships of one place to another. A website may facilitate this method by using site maps, diagrammatic representations, list of links or breadcrumbs.

Building on the literature about navigating methods and exploration, the initial aim of the study, reported in this paper, was to validate definitions for the web environment. In doing so, we discovered an extra couple of behaviours specifically related to web navigation: backward and forward tracking, that we relate to landmark, route and map within our exploratory grid (see figure 1).

EMPIRICAL STUDY

The experiment involved 9 participants, all regular web users, with an understanding of computer systems and applications. This provided rich data collection, and reduced irrelevant data obtained from the inability to use a web application effectively. Each user explored two web sites: a structured and an unstructured site.

The structured site was content rich (information/ organisational), provided a familiar structure to the participant using distinctive signs (hyperlink headings, page titles etc...) and its layout was typical of information/ organisational sites. It was the site of a large telecommunication company.

The unstructured site provided unfamiliarity to the participant, using inconsistent features, and structure. The web site of a graphic designer was chosen as the unstructured site. The use of animation, colours, and inconsistent design elements created the unfamiliarity in visual cues and landmark formation.

The participants were asked to complete a five-minute exploration followed by two tasks on each site. The exploration stage allowed participants to become familiar with the sites structure, navigation aids, and enabled us to observe exploratory behaviour without a defined task. After the completion of the exploration stage, participants were given their first task scenario. They were provided a description of a feature that existed within the site, with the goal to find the feature's page. The second task was less detailed, focusing on a specific service/product as the goal. The difference in task description provided deeper exploration, and generated detailed exploratory data.

In addition to observing and recording participant exploration, interviews were performed during and after the completion of the experiment. Throughout the observation the researcher triggered thinking aloud when necessary. The triggers were generally about why a participant used a browser navigation button, why s/he selected a hyperlink (navigation aid), and the thought process during the exploration, to obtain general feedback on the task being performed. After the completion of the observation, participants were asked several questions on aspects of their exploration and the sites they browsed. These interviews provided a connection between what was observed and the navigational data recorded.

DATA ANALYSIS

The gathered participant observations and interviews transcripts were analysed using a selective coding technique. The selective coding technique requires the researcher to organize raw data into conceptual categories, creating themes, which are used to analyse the data and then look for cases that illustrate the themes, making comparisons and contrasts (Neuman 2003).

For our analysis we extracted initial themes from our review of the literature, as briefly highlighted earlier, on navigation methods. We retained aspects in relation to the web context and we then extended the themes to exploration behaviours (as illustrated in figure 1).

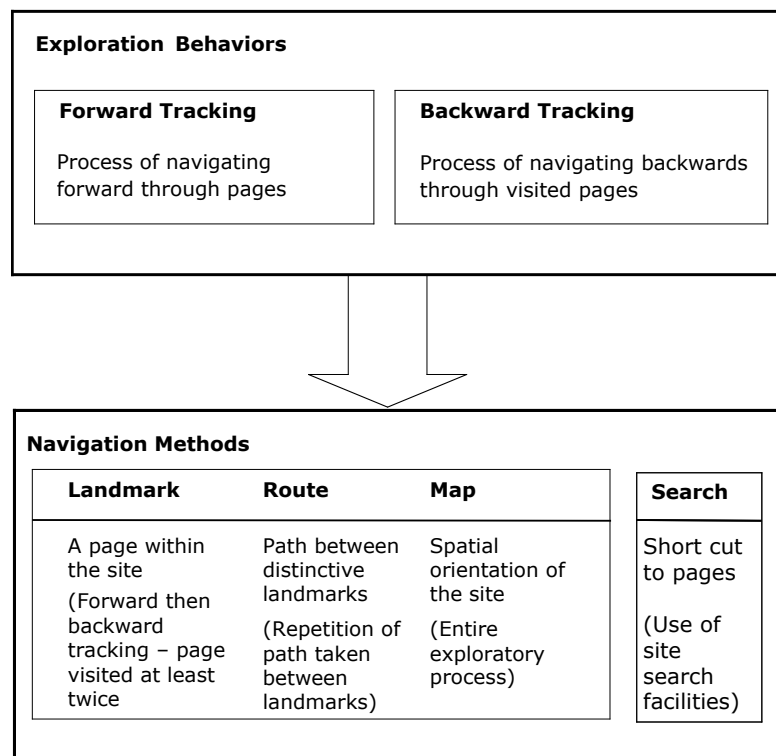


Figure 1. The Exploratory Grid

As presented in the rest of this paper, this analysis illustrated similarities and potential differences amongst the themes, and led to the refinement of the associated exploratory behaviours and navigation methods.

THE EXPLORATORY GRID

The exploratory grid groups behaviours and methods under two main themes. Figure 1 is a visual representation of the relationship between exploration behaviours and navigation methods.

Exploration behaviours

The use of navigation aids for exploring defines exploration behaviours.

The analysis of the findings indicated the existence of two main processes that participants engaged in whilst exploring: forward tracking and backward tracking.

Forward tracking

The forward tracking behaviour indicated the forward movement of exploring from one page to another. It was the process of exploring through the site uncovering pages down the hierarchy of the sites structure. This was provided through the selection of navigation aids, such as text hyperlinks, image hyperlinks, and the use of the browser components (mainly the forward button).

Backward tracking

After navigating through a series of pages, participants in most cases decided to navigate back to previous visited pages. The process of navigating backwards through pages previously visited was generally achieved by using the browsers back button. However, the use of a navigation aids within the site's content were selected on several occasions.

Navigation methods

In the web context, we noted that the explorations behaviours identify navigating methods (landmark, route, map and search).

Landmark

It was observed the process of using forward and backward tracking to a specific page, on more than a couple of occasions, indicated the participant was using the page as a hub within the task, or remembered an aspect of the page. This process indicated a landmark page. Boling (2003) defined a landmark as an identifiable feature within a landscape, and its use as a base for navigating out from and back. A landmark page was distinguished by the usage of the following navigation aids:

- Back button - Navigating backwards to the landmark page (backward tracking).
- Forward buttons - The process of navigating out from the landmark page (forward tracking).
- Content Hyperlinks - Used in providing a backward and forward tracking process for identifying landmark pages.

In addition, the opening of a new secondary window followed by its closure, after the participant had navigated through several pages, or viewed the single opened page, was seen as a forward and back tracking behaviour. This identified the page in the original window as a landmark page.

Route

Boling (2003) and Whitaker (1997) defined a route as a logical set of links that provide a path between pages. The route process was evident during the back and forward process findings. We observed repeated sequences of navigational paths between pages. Moreover, we defined starting and ending pages of a route as landmark pages. A path was considered a route if it was taken at least twice during the exploration.

Map

The use of the map/spatial orientation method for navigating was not evident in the findings. However, this is possibly due to the difficulties in observing participant's spatial orientation during exploration without requiring feedback on the process. Furthermore, as discussed by Whitaker (1997), the site map was used consistently throughout exploration. Although its usage does not indicate that a participant gathered specific spatial knowledge on the site under exploration. Nevertheless, it was considered that the entire exploration process performed by the participants represented their spatial orientation, and therefore a map of the sub-section in the site explored.

Search

The facilitation of the search facility provided participants with the capabilities of obtaining specific pages without the use of the preceding methods. The use of a search facility was classified by Whitaker, as a navigating method in the web context (1997). However, the search method is initiated by the use of entering keywords and the selection of a navigation aid (e.g., Search button), unlike the preceding themes, which require the combination

of back and forward tracking process. The use of a sites search facilities provides the user with a powerful navigational method during exploration and will be considered as part of the behaviours in modeling exploration.

CONCLUSION

Our initial findings reported in this paper provide us with a robust understanding and some new perspectives on exploration behaviours in the web context. These findings present two distinctive themes: exploration behaviours and navigation methods. These themes identified the usage and existence of the two human exploration behaviours (backward tracking and forward tracking) and four navigating methods within the web context (landmark, route, map and search).

In addition to the findings presented above, another category of findings were obtained based on general exploratory behaviours. These findings were extracted from participant feedback and observations while they were in their initial exploration phase, unlike the exploratory behaviour and navigating method findings which were obtained primarily from observations of the participants performing the predefined tasks. The general exploratory comments are beyond the focus of this paper; they indicated why actions were taken during exploration, and therefore were not used for the development of the exploration grid.

The exploration grid developed provides greater conceptual understanding of user's exploration in the web context. We are now working on the representation of such behaviours and methods in the context of task analysis and modelling, for helping designers to understand exploration deviations from an intended task path within web sites. This will result in better structured web sites that take into consideration the exploration of the user population.

REFERENCES

- Barton, S and Draper, SW. (1993) Learning by Exploration, and Affordance Bugs. *Proc. Human Factors and Computing Systems*. Netherlands. pp 75-76
- Boling E. Wayfinding. Accessed: 20/4/03. <<http://www.indiana.edu/%7Eeirg/ARTICLES/NAVIGATION/>>.
- Dillion, A, McKnight, C and Richardson, J. (1993) Space – the Final Chapter or Why Physical Representations are not semantic intentions. *Hypertext: a psychological perspective*. McKnight, Dillion and Richardson (eds). Ellis Horwood Ltd.
- Hammond, N. (1993) Learning with Hypertext: Problems, Principles and Prospects. *Hypertext: a psychological perspective*. McKnight, Dillion and Richardson (eds). Ellis Horwood Ltd.
- Neuman, W.L. (2003) *Social Research Methods, Qualitative and Quantitative Approaches*. Pearson Education.
- Raskin, J. (2001) *The Humane Interface: New Directions for Designing Interactive Systems*. ACM Press
- Rieman, J. (2003) Exploratory Learning. Accessed: 24/04/2003. <<http://home.att.net/~jrieman/jrexplre.html>>
- Soto, R. (1999) Learning by Performing by Exploration: Label Quality Measured by Latent Semantic Analysis. *Proc. CHI 1999*. pp. 410-425.
- Whitaker, LA. (1997) Human Navigation. *Human Factors and Web Development*. Forsythe, Grose and Ratner (eds). Lawrence Erlbaum Associates. pp. 63-70

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