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Interactive devices for faster access to information: navigation system for digital documents

Stéphane Caro Dambreville

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Editorial

Après 10 ans consacrés à l'étude des interactions entre les humains et les systèmes informatiques au sens le plus général du terme, et particulièrement l'interaction homme-machine et l'interaction humaine médiatisée par la machine (1997-2007), R.I.H.M. est désormais la Revue des Interactions Humaines Médiatisées.

Cette nouvelle formule est ouverte aux contributions inter-disciplinaires en psychologie, sociologie, sciences de la conception, sciences cognitives, ergonomie, informatique, innovation et créativité. Mais elle est particulièrement attentive aux apports de la science de l'information-communication, science encore qualifiée de « récente » qui ne rechigne pas à forger son propre appareil méthodologique en s'appropriant des outils et des démarches empruntés tant aux sciences exactes qu'aux sciences humaines et sociales.

A ce titre, ce premier numéro de R.I.H.M. « nouvelle formule » est exemplaire. Il démontre sans conteste que les deux cultures peuvent non seulement cohabiter au sein d'une même discipline, mais qui plus est se compléter et s'enrichir l'une l'autre pour élargir l'horizon scientifique de tous.

Ainsi, le premier article mobilise la méthode expérimentale pour évaluer le maintien en mémoire implicite de publicités intersticielles sur Internet (pop up) et le dépôt de traces affectives et sémantiques favorables à la marque trois mois après l'exposition. Il démontre en outre une supériorité du mot sur l'image, ce qui va à l'encontre des présupposés intuitifs.

A contrario, le second article revisite les outils formels promus par la théorie littéraire et la narratologie, notamment le concept de paratexte introduit par Gérard Genette dans *Palimpsestes* en 1982. En les transposant au cadre de l'environnement informatique en réseau, il montre que le repérage de catégories épitextuelles et péri-textuelles favorise l'élucidation de la complexité sémiotique du texte en réseau et institue des rapports nouveaux de sens, d'organisation et de pouvoir, qui désorientent le lecteur et dont une étude approfondie s'impose.

Le troisième article retrace quant à lui une expérience d'approche compréhensive couplée à une observation participante, conformément au

registre d'une anthropologie de la communication audiovisuelle où l'outil caméra se pose en catalyseur pour fabriquer du sens partagé parmi les jeunes d'une cité méditerranéenne.

Enfin, le dernier article ouvre le vaste champ de l'innovation. En effet, il propose un concept nouveau de « souris 3D » dotée de fonctionnalités de prévisualisation des objets pointés, outil dont l'exploitation permettra notamment de survoler le plan d'un site Web sans quitter la page active, ou de visionner le contenu d'une page avant de l'ouvrir. Ce projet a fait l'objet d'un dépôt de brevet, et la présentation de cet environnement, voué sans aucun doute à une destinée internationale, est proposée en anglais.

R.I.H.M. maintient ainsi le format de 4 articles longs en *varia* à raison de 2 parutions de numéros par an. En remerciant encore Bertrand David et Christophe Kolski pour le travail accompli, en profitant de ce passage de flambeau officiel pour leur souhaiter le succès dans les nouveaux projets qu'ils portent, en les remerciant de la confiance qu'ils nous ont témoignée, nous vous souhaitons à toutes et à tous une très bonne lecture et le plaisir de la découverte.

Sylvie LELEU-MERVIEL et Khaldoun ZREIK
Rédacteurs en chef

Interactive devices for faster access to information: navigation system for digital documents

Accélérer la recherche d'informations grâce aux dispositifs d'interaction : système de navigation pour les documents numériques

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Abstract. This article presents a step towards the inclusion of a preview control with established tactile interactive devices, such as the computer mouse and touch pad. It describes the origins of the device and its likely advantages in terms of ease of use and faster data retrieval as, for example, when a page previously consulted needs to be accessed again. The article limits itself to the contribution made by the device towards the consultation of digital documents, in particular on Internet sites. The device presented below makes it possible to leaf through a whole digital document from one and the same screen without mouse clicks. It can be used directly, by means of a command integrated into the mouse or touch pad, as a navigation tool to access the structure of a document, whether that is fixed in advance or dynamically recalculated each time.

Keywords. ergonomics, navigation system, interactive device, computer mouse.

Résumé. Cet article présente une démarche qui vise à doter les outils d'interaction tactiles usuels (souris informatique, pavé tactile) d'une commande de prévisualisation des objets désignés. Nous décrivons la genèse du dispositif ainsi que les bénéfices attendus en termes d'agrément d'usage et d'accélération des recherches d'information dans certains contextes (retrouver une page qui a déjà été consultée par exemple). Nous limiterons notre description dans le cadre de cet article aux apports du dispositif à la consultation de documents numériques et en particulier aux sites Internet.

Mots-clés. ergonomie, système de navigation, outils d'interaction, souris informatique.

1 General trends in digital documents¹

Interactive methods with digital documents are currently used to lessen constraints of space and time. This is achieved by devices that offer extra information from a particular point or extend consultation from a central one. The results of earlier studies on ergonomics are to be found, for example, in tables for the control of procedures in rail traffic, nuclear power stations and chemical factories. Another trend, harder to implement, is to present a document in different forms, which users can then adapt according to their expertise in the field and the platform from which the document has been accessed. There again, localized devices, such as the pop-up window, which offer an optional display of extra information, are one of the ways in which a document may be consulted flexibly. The pop-up is a device that displays a short message in a small window without any need to leave the screen or current page. There is a review of the influence of this device on the way readers deal with text on the screen (Caro & Bétrancourt, 1998). A pop-up may contain not only text, but also other types of communication, such as images, video, formulae and tables. Figure 1 shows an example of a pop-up.



Figure 1. Screen with pop-up window

With the use of pop-ups, the text permanently available on the screen can be made less dense. Whereas a newcomer to the topic of the document will be able to look up a definition in a pop-up, an expert in the field, not needing to, will not have a screen full of unwanted information. Several studies on pop-ups have shown that, if information is available in the same place and at the same time, without the need to load new pages or quit the current page, the mental burden on the user is reduced and it becomes easier to remember the information that is sought and to think about it in other ways, such as problem-solving (Bétrancourt & Caro, 1998).

The work presented below comes within the ambit of these trends, describing a new control integrated into the mouse, the trackpad and other manual peripherals interfacing with computers and terminals.

¹ A recent outline definition of the concept of a document has been proposed by a group of researchers within the framework of reflections on digital documents (Pédauque, 2003): "Ultimately, a document is simply a convention among people that constitutes part of their humanity and their capacity to live together. Its aspects may be considered as anthropological (legibility and perception of signs), as intellectual (comprehensibility and assimilation of text) or social (societal integration of the medium). These aspects should not be considered merely as individually efficient, but also as integrally coherent". (Salaün, 2004).

This definition illustrates the difficulty posed by the emergence of digital documents in relation to the very definition of the general concept of a document. Within the framework of this article, this is how documents to be consulted on the computer screen will be designated.

2 Origins of the device

The main problems posed by the intangibility of a virtual document are how to find your way around it and how to visualize it. This greater degree of abstraction can make it impossible to find information, to get your bearings in the document, to visualize its structure and, more generally, to know how to move from one place to another within it (Bernard, 2000). There are some authors who have referred to the "Elpenor syndrome" to describe these difficulties of topographical amnesia (waking up somewhere new) and to serendipity, or luck, for moving about in digital documents (Ertzscheid, 2003). To help users navigate them and to understand their structure, some digital documents include aids that show position, quantity, context and so forth (Caro & Bétrancourt, 2001). Of such aids, site plans are already extensively used (Russel, 2002). Several studies have shown that the tree-structure of a digital document should be limited to about three levels (Larson & Czerwinski, 1998). Many Internet sites observe these two parameters, of site plan and limited levels. Even so, navigating from a site plan or a homepage often means that you have to look up pages by trial and error and waste a lot of time opening and closing one window after another just to find a single piece of information. This is because there is not enough information in the site plan or on the home page or even often in the titles of the links and icons on it about what the indicated page will contain. If precise information is given about what will appear if a link is activated, the user will be able to choose the right page and avoid loading unwanted pages (Caro & Bisseret, 1997).

2.1 Towards previewing objects

Some operating systems or computer applications provide thumbnail views of files. The user may then decide either not to consult the file or to display it appropriately.

There are as yet few ways with digital documents of obtaining advance information about available pages. Some sites have an area on the homepage with links containing information about available pages. This information appears when you hover the mouse pointer over a link. The Biarritz IDLS site is a case in point. On the right of the web site, there is a fixed area that tells the user details of the sections to be found on each page. This display is activated by hovering over the links (cf. figure 2 for an example of a display while the pointer hovers over the link "Actualités").

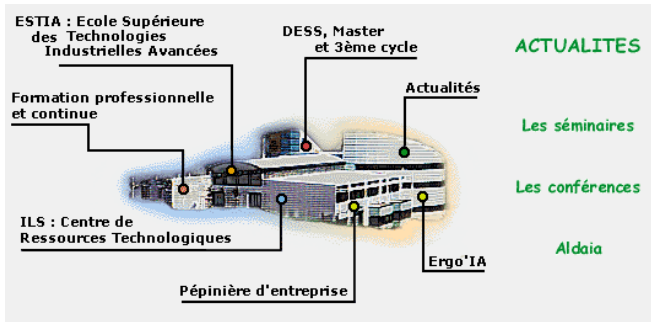


Figure 2. IDLS site of Biarritz; The pointer is positioned above the link "Actualités"; the area to the right displays the information that would appear if the link was clicked on.

The site "corlobe.tk" uses bubbles to indicate the textual content of the page that would appear if selected (Figure 3).

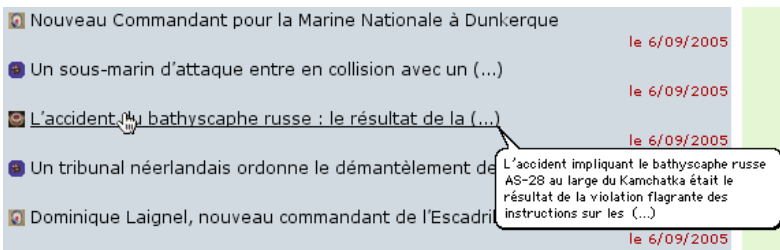


Figure 3. corlobe.tk site. Use of bubbles to display an overview of the information that would appear if the link were clicked on.

In both cases, the information is textual but limited in its content owing to the small size of the bubbles or, as with the IDLS site, of the display area (Figure 2).

Some browsers have plug-ins that can display a thumbnail view of a page. Neither the body of the text nor even the titles of the page are legible. This is the case with the "LinkPreview"² plug-in for the Firefox browser: if the pointer hovers over the link, a thumbnail view of the page appears. Figure 4 shows a preview page pop-up window during hovering using the "LinkPreview" plug-in.

² LinkPreview 1.9, Harry Patsis, 30 May 2005.



Figure 4. Preview pop-up window after a Google search. The cursor is positioned above the area "IUT ORSAY". The pop-up shows a thumbnail view of the page.


With the "BetterSearch"³ and "GooglePreview"⁴ plug-ins for the Firefox browser, a thumbnail view can be obtained of the pages found after a search (area on the left of figure 5). There is an overview of the pages without any need to hover. For pages for  Web Images Groups Answers Actualités sites Recherche dans Web Pages transphonies Pages France indicates that a thumbnail view is not



Figure 5. Previews of web pages after a Google search. All the pages from the search are displayed in the area to the left. The windows display thumbnail views of the pages.

These displays do not give the content of the pages, but only their graphical aspect, which is all that is needed to choose a page already consulted. Nevertheless, to improve the search for information, it is important to be able to use the titles, at least those that stand out. Indeed, in on-screen texts, which are usually technical, informative or didactic, the titles can give effective access to information (Eymard, 1992).

2.2 Representing the structure of a document

There exist also mapping devices for digital documents⁵. These can generate a dynamic view of the tree-structure of a digital document and provide a formal

³ BetterSearch 1.9, Carlo Zottmann, 29 August, 2005.

⁴ Google Preview 1.0.1, Edward Ackroyd, 26 August 2005.

⁵ The tree-structure of a document corresponds with its navigational structure and can be shown graphically by a flowchart whose rectangles represent the pages and junctions the links

representation of it analogous to a site plan (the Mapa application of Dynamic Diagrams) (Nanard & Nanard, 1998). These tools still use traditional means of interaction, however, such as clicking or hovering the mouse over reactive areas.

2.3 Transparency and interfaces

Transparency is beginning to be used in interfaces in certain cases referred to as the mirror effect (Vernier *et al.*, 2005). Little is as yet known about the possible application of this presentational device in digital documents. Some operating systems also use transparency for "aesthetic" ends to display windows, without any demonstrable benefit to the user. Fish-eye and magnifying-glass effects are also beginning to appear in operating systems (Windows XP et Mac OS 10) for visual effects related to a more detailed presentation of icons.

The device presented below makes it possible to leaf through a whole digital document from one and the same screen without mouse clicks. It can be used directly, by means of a command integrated into the mouse or touch pad, as a navigation tool to access the structure of a document, whether that is fixed in advance or dynamically recalculated each time.

2.4 Metaphorical immersion

At present, neither mapping nor preview is part of the function of pointing devices such as the mouse or touch pad. The latest innovation in manual interactive devices in general use is the mouse wheel, which scrolls texts without any need to click on the scroll bars. The concept, presented by Microsoft at Interact'97, is now a part of most types of mouse. Studies have shown that one mouse button is better than two, as users forget what each button does. It would be useful therefore to have something different from the mouse buttons, having its own tactile peculiarity, that would be easily associated both technically and metaphorically with navigating a digital document using a mouse or trackpad. A general "squashing down" of part of the body of the mouse, using small dampers, or shock absorbers, would correspond nicely with the act of "immersion" in the heart of a document and its structure.

3 Description of the device⁶

No method exists of "leafing" through a digital document, as you would a paper one. You cannot flick through a digital document as you can with the pages of a paper one. Nor can you glance at a page and see its content well enough to be able to decide whether to disregard it or consult it. With the device described below, you could leaf through a digital document, such as a web site or a CDROM, very fast without mouse clicks. With this system, traditional interactive devices, such as the mouse and portable computer touch pad, could be used in a new way to navigate a digital document in depth. It works, therefore, like the mouse wheel, with which text is scrolled without the use of the scroll bar.

3.1 Device hardware

The hardware of the device involves a rectilinear sensor suspended on a spring system, not unlike a shock absorber, inside the pointers. With a mouse, then, part of its body could be depressed, or squashed down. The description that follows shows

between them. Some applications generate this graphic representation automatically and, for the sake of legibility, show only part of the links between the pages.

⁶This description relates for now only to digital documents. A plug-in for operating systems and other applications is possible.

a computer mouse modified with this device¹⁷. A substantial part of the body of the mouse (the dark part in figure 6), called the preview control, is spring-mounted and connected to a rectilinear sensor, rather like a shock absorber. When you press down with the palm of your hand, the preview control is lowered in an unbroken movement and navigation becomes accessible (Figure 6).



Figure 6. Model of a mouse with preview control

3.2 Device software

When you consult a web site page, in this case www.apple.fr, version June 28 2004 – Figure 7, you may not have a clear idea of the structure of the whole site. If the current page is not the homepage, it might be hard to work out its position in the whole document.



Figure 7. Homepage of www.apple.fr June 2004

When you apply the preview control, you can see, through a special transparency effect, the structure of the information analogously to a table of contents or site plan. The information is classified by its level in the tree-structure and is displayed in a pop-up. By hovering over the links, you get an overview of the available pages. How far you push down the preview control relates to the opacity of the plan window. The maximum will be somewhere between 95% and 100%. The reader can thus maintain the overall view of the initial window while noting the

¹⁷ For the trackpads of laptops, the whole surface might be depressed. For those without trackpads, a mouse with a preview control could be installed.

temporary display of the plan. Figure 8 shows the sequence of the appearance of the plan following pressure on the mouse's preview control.



Figure 8. Transparent pop-up of the structure of the site

At the same time, you can move the mouse sideways and display each screen (Cf. Figure 9).



Figure 9. Transparent appearance of a view of a page as the pointer hovers over one of the links of the plan

You can hover over the various links of the "plan" window to get an overview of each page. If you release the pressure from the palm of your hand, the page in question is displayed in full just as would have happened if you had navigated in the traditional way by clicking on a link. The fish-eye effect is intended to distinguish

among the three spaces displayed: homepage (full screen), plan (pop-up) and page pointed at (fish-eye).

It would also be possible to preview a page before loading it completely into memory, without recourse to a display of the plan (direct preview). When the pointer is hovering over a link or reactive zone, the preview control produces a preview of the page pointed at (cf. Figure 10).



Figure 10. *Transparent appearance of a view of a page while the pointer hovers over one of the links of a web page (without displaying the plan)*

If the pointer is not hovering over a link or reactive zone, the preview control produces a display of the plan of the document. Hovering over the links contained in the plan then produces a preview of the pages pointed at, as described above.

4 Conclusion: advantages of the device

The quite new convenience offered here is to be able to navigate a reduced view of a document in order to select, find and load only the relevant pages. This would bring an improvement in speed and precision, as fewer pages would be consulted to find the relevant information and less time spent online. Initially, connection times may be greater as the thumbnail views were loaded, but after that time is gained, since only the relevant page needs to be loaded. This makes for faster and pleasanter navigation with less trial and error.

If this device were integrated into operating systems or computer applications, it would mean significant developments in their interactive possibilities. Its principal use and the easiest to implement would be in online documents and especially Internet sites. Following the prototype, a series of experiments should verify the progress of the system, especially in information research, and also in terms of ease of navigation. Also, if the user has access to a navigational system in a dedicated area of the screen, that could lead to new ideas about the organization of space on the screen, with more space for information and less for navigation. Vertical and horizontal banners showing links could disappear or be simplified to free up space and display more content on the screen. There being various techniques already available for navigating web sites directly with the use of the mouse, this new

control is part of the movement towards a greater integration of interactive navigational devices⁸.

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⁸ The technical device presented above is the object of a patent application by the University of Burgundy (France).

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