

Libraries: comparisons between the real and the virtual in 3D, 2D zoomable and 2D arborescent

Cédric Dumas, Frédéric Jourdan

Ecole des Mines de Nantes
4, avenue Alfred Kastler
F-44300 Nantes, France
{cdumas,fjourdan}@emn.fr

Patricia Plénacoste

LIFL
Batiment M3, cité scientifique
F-59650 Villeneuve d'Ascq, France
Patricia.Plenacoste@univ-lille1.fr

ABSTRACT

The HyperVise project tries to facilitate the access to the large-scale digital libraries. One of its axes of research consists in listing some methods of research that exist in the real libraries and make defect in the virtual ones, and try to transfer them. Among these methods, we are especially interested in research by proximity and to the fortuitous and haphazard finding.

To value the capacity to transfer knowledge (from the places and from the methods of researches) between the real and the virtual world, an experimentation is currently in progress. It consists to create a 3D and 2D models of a real library (the one of the school of Mines of Nantes) and to verify if a person knowing well the real library reuses this knowledge efficiently on a similar virtual environment, 3D or 2D.

Keywords

digital libraries, zoomable user interface, 3D interface, navigation, evaluation.

INTRODUCTION

The final objective of the survey aims to the assessment of several techniques of visualization focus+context in situation. Numerous techniques of visualization of information have been proposed last years [1], but we can note that they rarely made the object of systematic comparative evaluations. These new techniques have a high practical interest: they offer new solutions to problems of navigation in large databases. They could constitute an efficient alternative to usual techniques of navigation (for example in a hypermedia space as the Web) or to the traditional « workspace metaphor » introduced about twenty years ago by the Xerox PARK and popularized by the Macintosh.

One of the classic problems of navigation in large databases is the phenomenon of user disorientation. This one often finds oneself in a situation where it is difficult to localize itself accurately and to value the shortest path to reach a point of interest. This phenomenon induces to do many back returns with a classic navigator that bounds to

a difficulty of spatialization in the information space. In the same way, users often meet certain difficulties to memorize the interesting information position previously found and the path done to arrive there. This problem, presumably bound to the deficit of spatialization already evoked, harm therefore to the efficiency of interactive research situations where the user tempts to recover an information already view. The technical focus+context can offer an interesting solution to solve partially some of these problems. They first of all permit to decrease effects of decontextualization because objects of interest are visualized while preserving a global vision of their context. They also avoid some problems of cognitive overload due to their principle of graduality of the information visualized, especially when they integrate the semantic zoom concept. It is for this reason that we chose as our first object of evaluation a zoomable interface (ZI), achieved with the Zomit system [2], a tool of ZIs developed to the ENST (Ecole Nationale Supérieure de Telecom de Paris).



Figure 1: Library from the school of Mines of Nantes, used as reference

We interested ourselves to the use of 3D metaphors in a context of human-computer interaction. This type of representation should logically encourage the spatialization of the data space by the user, but it seems also an interesting approach to facilitate the user sauntering and making accidental discovers. Our second evaluation is therefore on such 3D models use, based on an environment developed to the EMN (Ecole des Mines de Nantes).

We compare these ways of research in a joined survey valuing the behavior of a user trying to find some books into a library. The three following cases were considered:

- research in a real library (figure 1),
- virtual research with the help of an zoomable interface (figures 2),
- virtual research in a 3D model of the library (figure 4).

The comparative evaluation of these environments is currently in progress. Besides the comparison of the efficiency of these methods, we will also take in amount the training transfer of the real world toward the virtual and vice versa.

ZOOMABLE INTERFACES

Zoomable Interfaces (ZIs) are not anymore a novelty and their principles and convenient applications have been presented in numerous publications [3]. When somebody uses a ZI, he sees a view of an information space. The initial view shows the whole space (with a scale factor allowing to make it hold on the user's screen). The user can zoom in and out (to enlarge) a part of the view that he finds interesting. The graphic objects enlarge until there is enough room on the screen to replace them by other graphic objects that show the underlying data with more of details. This technique, called «semantic zoom», has been used to browse our library database (figure 2).

Layer of context and historic layer

The ZIs are made to present a whole set of information to users. The view of information presented to users, the focus, does not include enough context with a high level of zoom. Then, the user can't situate what they see in the space of information, they are disorientated, lost in the information space. We present two new temporary tools that users can make to appear and to use when they arrive in this situation.

The first proposed technique, called layer of context combines the «focus» (the current interest point) and its context without distortion of the representation. This layer is temporary and is displayed when the user wants it. During its utilization it superimposes itself in transparency to the main view.

The second view, called historic layer, permits to displace itself interactively between the initial view and the current view while following the path borrowed by the user.

The system finally has a third help of navigation that is always visible and that facilitates the navigation permanently. This help, made of a second zone of display in the ZI, shows the hierarchy of the information space and the user's position in this space.

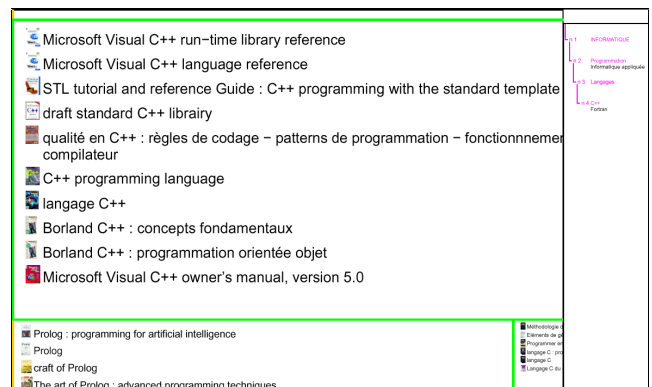
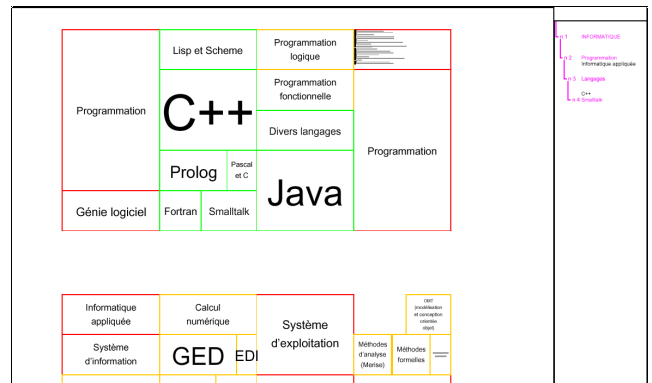
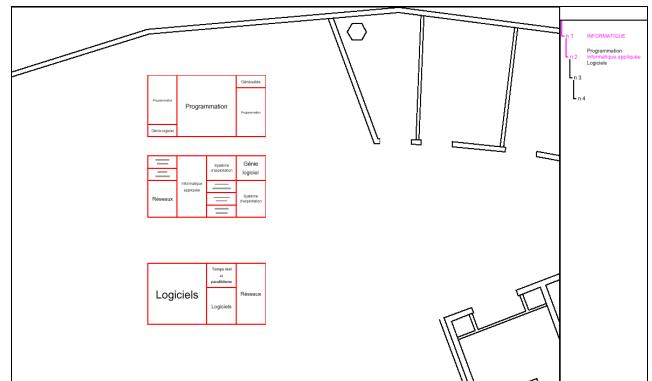


Figure 2: EMN digital library in a zoomable user interface (with 3 different levels of zoom)

Interaction by Control Menus

Users need simple means to zoom in, zoom out and move (pan) in the view.

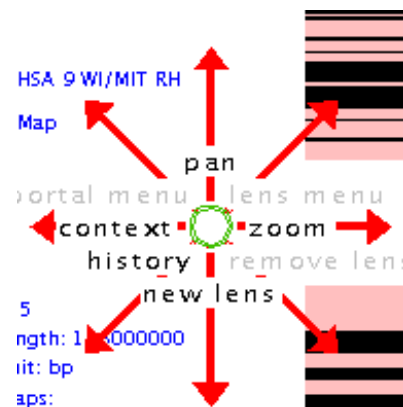


Figure 3: a Control Menu

We use a Control Menu (figure 3), that allows a quick access to the numerous operations in a ZI. This menu,

looking like a pie menu, allows users to select operations to do and to control them interactively.

3D INTERFACE

A lot of places are familiar to us, our places of dwelling, of work, stores where we make our shopping or shops that we frequent. Most interfaces make no profit of this knowledge. They only propose us the abstract or generic virtual places. However libraries are especially rich in important details that we know to use with a little practice: the new magazines, the site of shelving, the appearance of books according to their age or their consultations, all these elements help us for different tasks.

We think that while using a representation 3D [4][5] of an existing library, it is possible to transfer the implicit knowledge acquired in the real world, and to take advantage of it for several types of activities; in particular, to search by proximity, to select quickly some works, to discover news or to make some fortuitous meets.

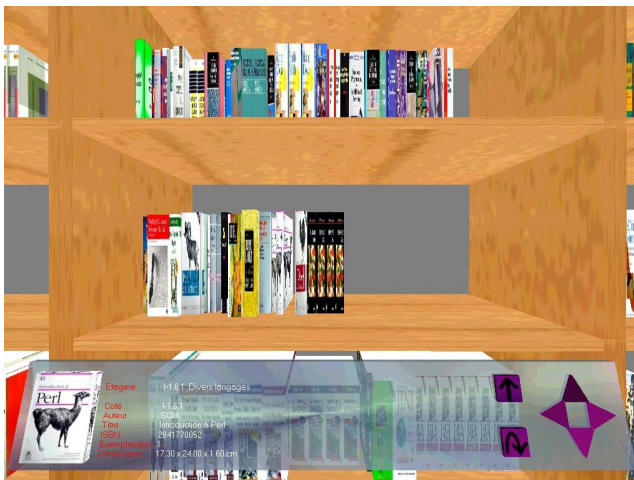


Figure 4: Representations of the 3D library

The library of the school of Mines of Nantes has been designed in 3D with its shelves and books (figure 4). Thanks to a simplified navigation interface using direct manipulation, the user can move everywhere in the digital library with two modes. A classic mode based on direct movement allows him to move toward and to turn on himself (with the mouse). A second mode uses an assisted navigation tool: the system knows the topology of the space, and move directly the user from shelves to shelves, find-

ing ideal viewpoints for each position to see the full shelf and browsing the books.

Finally, while passing the pointer on books, the user sees the name of category, titles, covers, etc in a front panel.

EXPERIMENTATION

To verify some of our hypotheses, we brought up experimentation comparing the behavior of library users in a task of research by theme. The comparison is made on four representations of the same library: the physical library, a 3D model, a 2D zoomable interface, and a classic 2D arborescent view. This evaluation is in progress and will allow us to compare qualities of each representation and style of interaction for any task of research.

Progress

To achieve our experimentation, we use about eighty people, divided in 4 groups of twenty subjects each (figure 5), according to each virtual situation: 3D interface, 2D zoomable interface, 2D classic arborescent interface, and a fourth group to compare together the 3D interface and the zoomable interface.

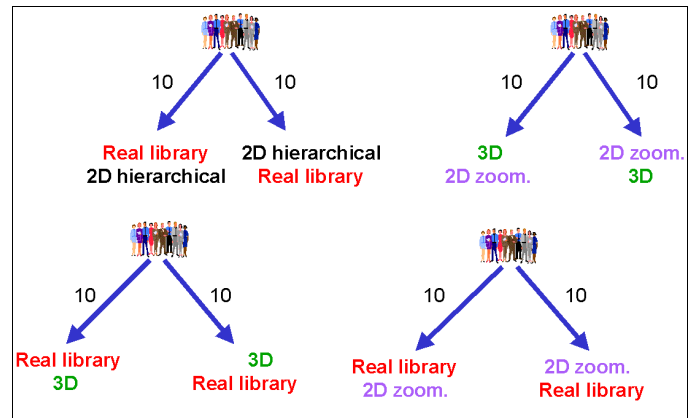


Figure 5: users distribution in experimental groups

Tasks

A first task consists to remember the organization of the different categories according to shelving. The users fill a covering sheet, they draw the sense of categories organization. The second task consists to find any book in a category and to mark its ISBN number. This task is repeated until the time of research does not improve anymore. The last task consists in finding two particular books in a category. These tasks are crossed according to groups. For the virtual environments, subjects first make the training of the navigation and the different actions in the virtual environments. When they are at ease with the interactions, they can achieve the three tasks.

CONCLUSION

We want to verify that a person, knowing well the real library, reuses this knowledge efficiently on a similar virtual environment, 3D or 2D. If this transfer of knowledge proved out to be efficient, the access to the virtual libraries would be facilitate for people already knowing a real library. Then they'll be able to use some new types of searching methods that do not exist now in digital libraries.

ACKNOWLEDGMENTS

This work is part of the HyperVise project, financed by France Telecom R&D. The aforementioned environments are otherwise in free access on the Web to the URLs:

<http://www.infres.enst.fr/net/zomit/>

<http://www.emn.fr/fekete/HyperVise/cdi3D/cdi3D.wrl>

We thank for their work on this project: Stuart Pook and Eric Lecolinet (Zomit), Jean-Daniel Fekete and Frederic Jourdan (2D prototypes), Sebastien Treillaud (3D prototype).

BIBLIOGRAPHY

1. Card, Stuart K, Mackinlay, Jock D, Shneiderman, Ben, Readings in Information Visualization, Morgan Kaufmann, 1999.
2. Pook, Stuart, Lecolinet, Eric, Vaysseix, Guy and Barillot, Emmanuel. Control menus: Execution and control in a single interactor. In CHI 2000 Extended Abstracts, pp. 263-264.
3. Benjamin B. Bederson and James D. Hollan. Pad++: a zooming graphical interface for exploring alternate interface physics. In Proceedings of UIST'94, ACM symposium on User Interface Software and Technology, Marina del Rey, California, 1994.
4. Neill A. Kipp and al. Case study: digital libraries with a spatial metaphor. In SGML/XML'97 Conference Proceedings, Alexandria, Virginie, 1997. Graphics Communications Association.
5. Pierre Cubaud, Claire Thiria, and Alexandre Topol. Experimenting a 3d interface for the access to a digital library. In Proceedings of DL'98, ACM Conference on Digital Libraries, Pittsburgh, 1998.