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A HYPERTEXT FOR AN INTERACTIVE VISIT TO A SCIENCE AND TECHNOLOGY MUSEUM

O. Signore, S. Malasoma, R. Tarchi, L. Tunno and G. Fresta
CNUCE
Institute of CNR
Pisa (Italy)

According to Nielsen (1990), "hypertext is non-sequential writing: a directed graph, where each node contains some amount of text or other information. The nodes are connected by directed links. In most hypertext systems, a node may have several out-going links, each of them is then associated with some smaller part of the node, called an anchor. When users activate an anchor, they follow the associated link to its destination node, thus navigating the hypertext network".

When the content of a node is made not only of textual information, but also of other kind of media, like graphics, sound, and so on, we may use the term hypermedia.

Hypertext and hypermedia have been object of great interest in the last few years. Two major areas of application are education and documentation.

However hypertext, in spite of its interesting, and in some way unique features, is not problem free. As it is well known, disorientation is one of the most relevant problems the user can be faced with, and this gives raise to the "lost in the hyperspace" sensation. A possible way out can be the implementation of several interaction paradigms, in order that the user could find out, time to time, the right way to get the information necessary to continue the exploration of the hypertext.

This approach should also increase the possibility that the "world" of the designer will match the "world" of the user, and it is well known that the cognitive psychology identifies this aspect as one the most significant in the design of the user interfaces (Normann, 1988). In addition, the user interface should support several interaction paradigms.

As a consequence, one of the most important objectives to pursue is to give to the user the possibility of moving freely in the hypertext, maintaining the control of its position, following different interaction mechanisms: contiguity, affinity, association.

The "Ipertecne" hypertext

Data and their structure

In this paper, we will describe a hypertext built to permit an interactive visit to the "Fondazione Scienza e Tecnica", a museum located in Firenze, documenting the 19th

century science and technology (Gravina, 1991). Subject areas cover natural and artificial goods used in industrial processes, botany, paleontology, zoology, geodetic instruments, chemical laboratory, plants and seeds. One of the most relevant parts are constituted by the physics laboratory, which contains more than 1500 instruments, produced by several European firms in the 19th century.

Presently the hypertext covers a small portion of the physics instruments.

The implementation of the hypertext has to be considered an enhancement of the previously existing information system. In fact, a data bank about the content of the museum was already in existence and therefore the first step has been the extraction of the data from this database and the automatic insertion into the appropriate hypertext nodes. However the links, that constitute one of the most relevant aspects of the hypertext, have been introduced manually. In fact, some of them could have been identified automatically on the basis of the indexes used by the Information Retrieval System previously adopted.

The hypertext has been designed making use of methods and techniques coming from other areas pertinent to data management. In fact, the basic architecture has been derived directly from the conceptual schema, as is common in the database environment. Basically, every entity has been mapped into a specific type of node, whose structure accounts for the properties (or attributes) of the entity. The links between the nodes are both extensional and intentional, and map the associations between the entities, the implicit references to the dictionary terms, the user annotations, and so on.

General features

The hypertext revolves around the Objects, each of them, in turn, may be related to other objects or persons (the maker, the inventor, the discoverer of its physical principle) which can be related one to another. Quite obviously, every object has some related documentation: bibliography, photos, original ancient drawings.

Description of the instruments is made understandable thanks to a dictionary of technical terms, which can be linked.

The information nodes have been implemented as "cards". Most attention has been paid to the design of the layout of the cards, in the aim of helping the user to maintain his/her orientation. Therefore, the cards have a clearly distinguishable layout, so that the user can immediately realise which type of information node he/she is dealing with. (Fig.1)

It is well known that one of the peculiarities of the hypertext/hypermedia applications is the fact that the user is stimulated to be "active", by a "point and click" interaction style. Therefore, a precise choice has been made: on every node only a limited amount of information is automatically displayed. The user can obtain any additional information simply by clicking on the relevant icons. This choice certainly stimulates the user to follow his/her interests, avoiding the overload of information, that may sometimes obscure the relevant items that act as associative links between the information nodes.

The previous choice is emphasised by the decision of avoiding any text on the card buttons: their functions should be understood simply by the icon. This choice makes the user more interested in their functionalities and can help in case we wish to implement a multilingual version of the hypertext. It is obvious that a help function can be activated, so that the user can be aware of the effects of the several buttons present in every card. We have to notice that the positions and functions of the buttons are kept coherent in all the card types, and, even more important, they have been placed taking into account some ergonomic factors. More precisely, we grouped together the buttons that display additional information, the navigation buttons, the buttons that allows the user to select

Fig. 1 A sample "object card"

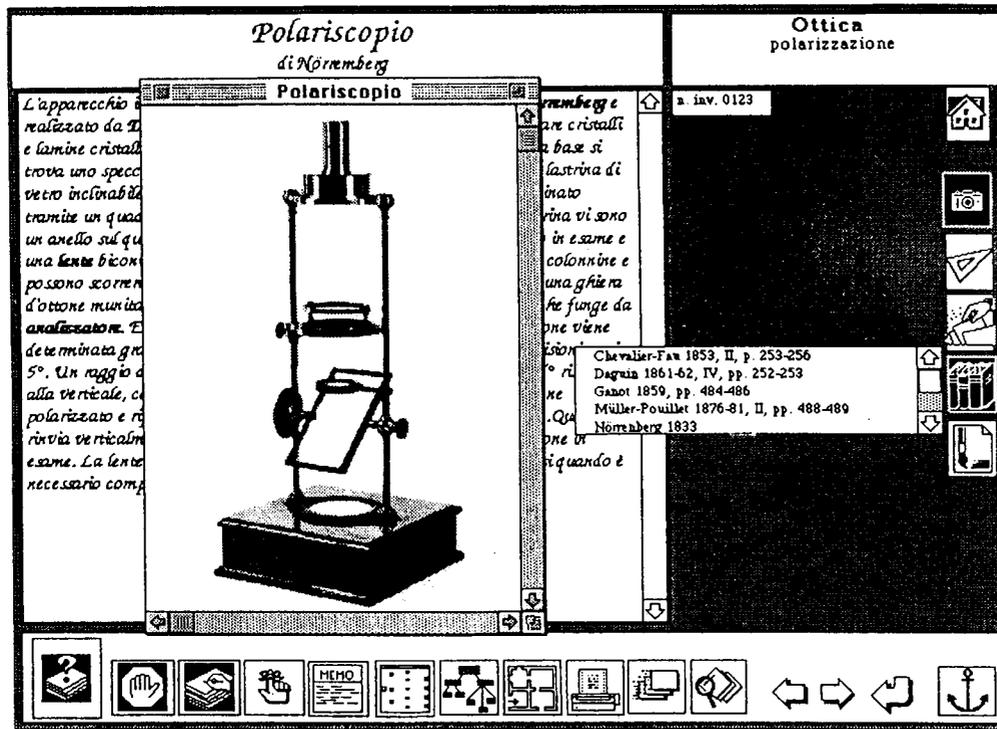


Fig. 2 The interaction paradigm based on the classification scheme

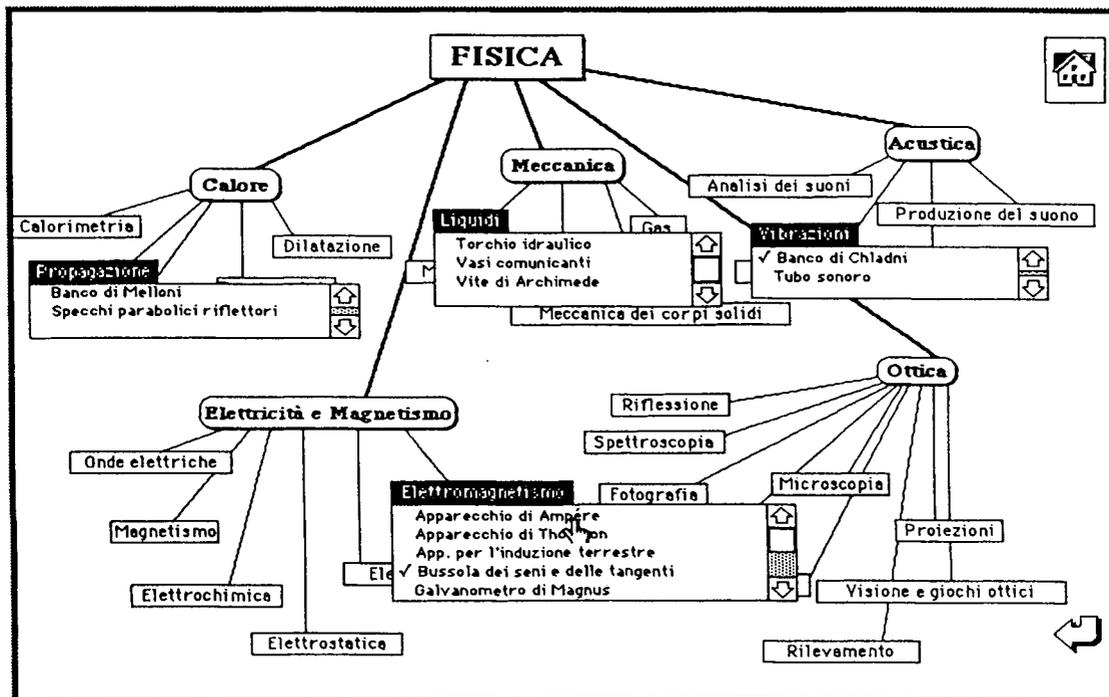


Fig. 3 The interaction paradigm based on the topographic map

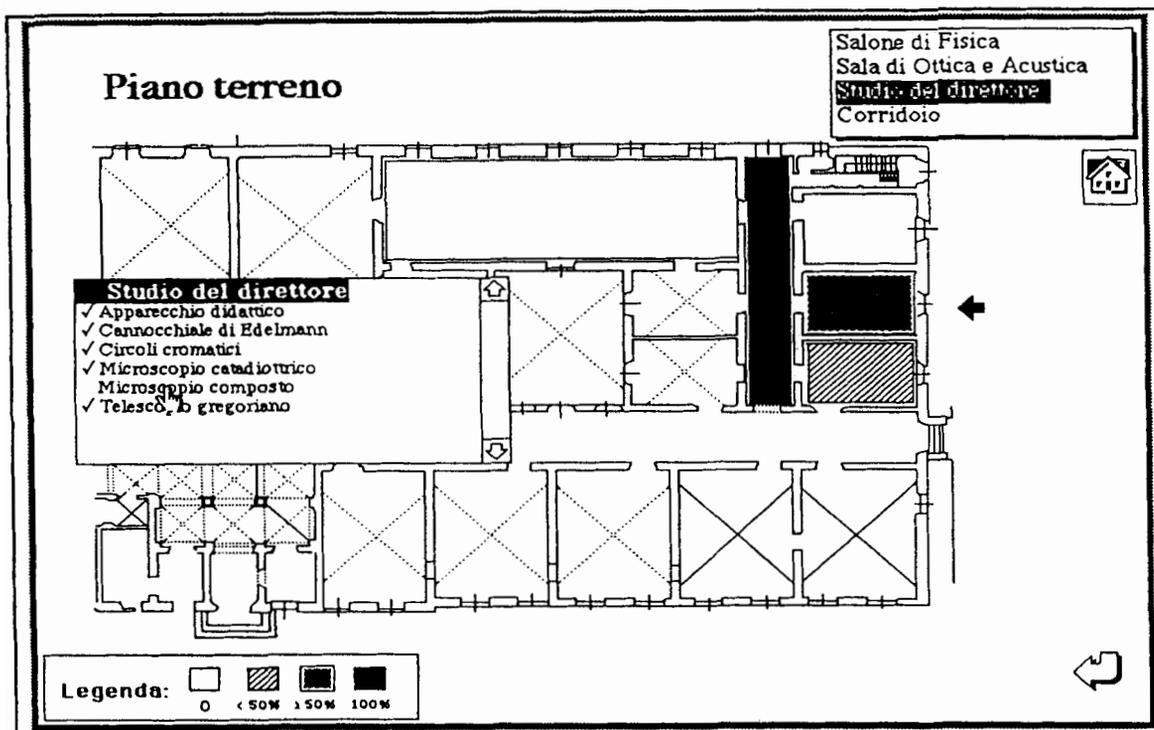
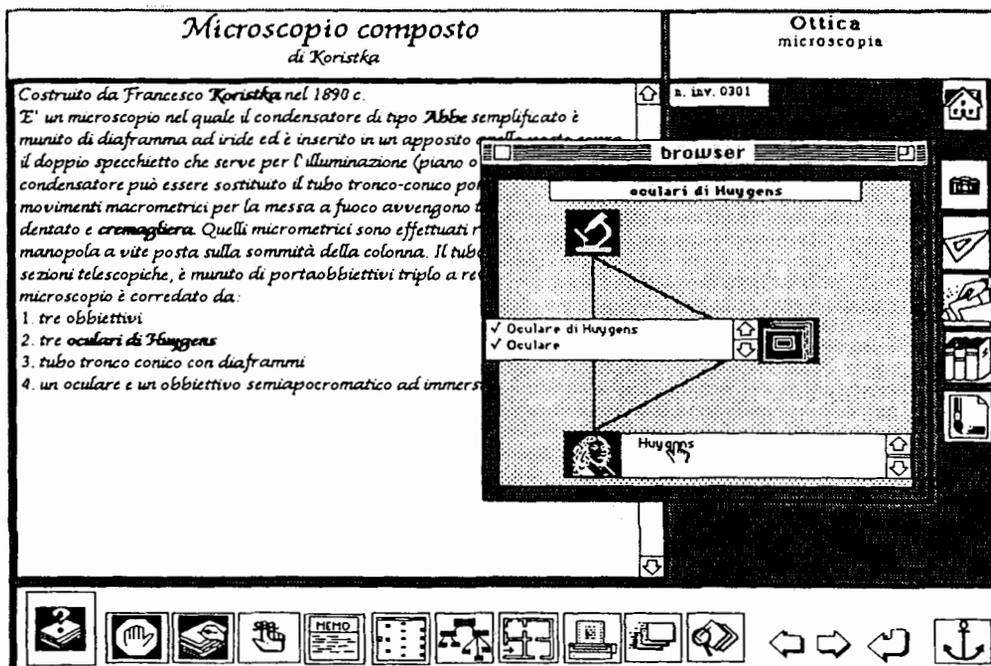


Fig. 4 The visualisation of multiple links



an interaction paradigm (map or classification) or to formulate a query. Finally, we grouped together help, exit, annotation and other service buttons.

As far as the user interaction is concerned, we have to note the possibility of making annotations and marking the relevant information. This mechanism can be used to define "guided tours", that can be stored and followed, afterwards, by other people.

Finally, it is possible to search an information node by its content, making use of the traditional operators available in any information retrieval system based on inverted lists of term extracted from the free text.

Navigation and links

Navigation in the hypertext constitutes a basic issue. Many applications fail to satisfy the user's information needs because of effect known as "lost in the hyperspace". As a matter of fact, it often happens that the user cannot find an appropriate "entry point" in the hypertext, neither can decide which are the most interesting links leaving from the current node.

As a consequence, the major emphasis has been put on the navigation mechanisms, which have been implemented making use of different browsers, that implement different paradigms of interaction. As shown in Figs. 2 & 3, the user can move from a classification scheme, and go to the objects of interest, or consult a map, which will allow them to choose the objects that are found at a specific location in the museum. The user can move from one browser to the other at his/her will, while the information is kept consistent.

Another important aspect is the implementation of multiple links, not supported by the native software. When a single anchor point in an information node is connected to several other information nodes, we display a map of the available links (Fig.4). The user will choose the more interesting for his/her purposes.

This peculiar aspect is presently the object of further development. We are implementing a more "active" mechanism, that attributes a weight to the links, and displays the relevant target nodes arranged in a map where the distance among the current node and the target ones accounts for the relevance of the link.

Conclusion and future developments

In this paper we presented a hypertext/hypermedia for the interactive visit to a science and technology museum. It must be stressed that the architecture of the hypertext/hypermedia, and the implemented facilities, aimed, in this first development phase, at some general methodological aspects, especially the navigation and the organisation of the information. Little attention has been paid to other mere technical aspects, like images (that, anyway, are presently managed in black and white and colour). Other aspects, essentially animation and sound (that can be easily added making use of the appropriate software extension), are presently going to be added.

At present, in parallel to the engineering of the software, we are considering some improvements, both technical and methodological.

From the technical point of view, we are improving the management of the images. As far as the methodological aspect is concerned, it is worthwhile to mention the implementation of a new interaction paradigm, based on the display of the images, with the aim of increasing the usability and user friendliness. In this interaction paradigm, the user will no longer see a simple list of object names, but also a sequence of related images. A click on the relevant one will bring it directly to the corresponding card. The displayed images will

be associated with the particular class, or related to the specific room, depending on the interaction paradigm he/she is currently using.

As future work, the map of links will be "active" in the sense that the affinity of the nodes, and hence their distance in the map, will be affected by the type of links followed by the user during the navigation in the hypertext.

