
THE WEB TO SUPPORT CREATIVE DESIGN IN ARCHITECTURE

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ABSTRACT

The use of the web in a didactic context appears to be extremely meaningful and effective. In Architecture, the web has huge potential: among others, it has the ability to gather an enormous amount of information, and the ability to create an active learning environment, one which affords the learner opportunities to engage and think

The paper reports on a Web Based Instruction (WBI) system developed at the Italian National Research Council -Institute for Educational and Training Technologies- to support design activities for students of the Italian Faculty of Architecture and Civil Engineering.

Original features of the system allow students to study and design in an effective way. Specifically, a particular set of "virtual stationery items" has been implemented and integrated in the system to help students, enrolled on on-line courses, to mimic important traditional study activities, still gaining all the advantages of using the Web. These tools are integrated with communication tools in the same learning environment.

A very important feature of the WBI system is that authorised users can enrich the information network in the system, by adding new pages and new links.

In the paper we report on the structure of the system, with particular focus on the information domain. Some of the "working tools" which allow users to simulate traditional study activities and the hypertext extension mechanism are also described

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Introduction

The use of the computer in Architecture is now an established fact. The draft board has definitely been replaced by the computerized graphic station (computer, plotter, scanner, graphic tablet) so much so that is difficult to find a professional study without such equipment. There is still a widely held opinion, however, that "representing" a project of architecture through the use of these tools is enough to guarantee an acceptable qualitative level of the product (building or urban area).

Actually in these quite common cases the computer is not used to "control" the process of designing, but only to formalize its final results; these results are often the outcome of considerations that leave out intermediary evaluations based on new technologies.

The planetary spread of new technologies and the whirlwind development of software packages for assisted design, increasingly considered to be powerful, effective, easy-to-use "intelligence integrator", has led to a radical revision of the classical ways of designing.

The idea that the computer can also support the phases which are preparatory to the real project is becoming more common even among the professionals with less expertise; in fact, the project is founded on the acquisition of the empirical data which the project must consider, by analyzing previous experiences, searching for the technical documentation, studying comparable formal solutions, and so on. All these activities can be supported by the New Technologies. In this context, the telematic communication tools are proving to be particularly strategic.

Taking into account the above considerations, we have developed a Web-Based Instruction system to support the students of the Italian faculties of Architecture and Building Engineering in the definition of projects that can concern either single buildings or whole parts of city. The didactic approach to the question arises from the conviction that the knowledge of the potential offered by new technologies in the field of architecture should be fostered from an undergraduate level, thus trying to train architects who are sensitive to the problems related to a new approach to the project. The use of the web in a didactic context appears to be extremely meaningful and effective; in the specific field of application, the web has huge potential: among others, it has the ability to gather an enormous amount of information which is necessary in Architecture, and the ability to create an active learning environment, one which affords the learner opportunities to engage and think [Hill, 1997]. In particular, creative thinking, which is central for architects, can be supported by the Web.

The system which has been developed tries to make the most of the opportunities offered by the Web. To this end, the system allows users to manipulate the information collected in the web pages of the "Analysis Area" by using particular tools and to perform collaborative study activities on the specific themes of the on-line didactic modules. These possibilities offered by the system confirm that "...the "Web" is not just a metaphor, for there truly is an interconnected network of individuals, institutions and organizations, around the world, opening up new possibilities for design, planning and information sharing in cyberspace..." [Ervin, 1996].

The system and its work areas

New Information and Communication Technologies can support the teaching of disciplines such as Architectural Design and Planning which are traditionally based on the study of past experiences, and which are characterised by a very subjective element. This subjective element is the result of the designer's personal sensitivity, his/her cultural background and, finally, his/her ability to manage all the different types of information that contribute to the definition of a project, at the scale of buildings, landscapes and urban forms.

For this reason, the hypermedia system that we have developed is aimed at supporting the students, enrolled on on-line courses, from the beginning of the design process.

The system is organized in two "work areas" respectively named "Analysis Area" and "Design Area". The "Analysis Area" organizes -in a hypertextual way- the "external" and "objective" information necessary for the design (data on the town and on particular areas, the context for a new building, building regulations, administrative laws, formal and bibliography references, and so on). The "Design Area" provides Web-based synchronous and asynchronous communication tools (e-mail, electronic discussion forums, video-conference system, chatting) and includes tools to support the "control" of the project (virtual galleries, shared blackboard).

The two work areas are related to the most important phases of the conceptual designing process. These phases usually consist in searching for information and transforming it into the project that should satisfy the expectations of the final users.

Actually, one of the major features of the system is the integration of these initial moments, thus allowing students to better understand the unique character of designing activities. Through the use of specific tools, the user has the possibility of alternating search activities and real planning, comparing his/her own results with those of other users and with the teachers of the on-line courses.

The information domain

The system can be used to support the redefinition of any part of the city which needs spatial and functional refurbishment or of some areas on the border of the city still lacking a real identity. For this reason information in the system is at the scale of landscape, city and building too. As a case study, we have chosen the city of Palermo and, in particular, its sea front, in view of its future redevelopment.

Central to the design of the system has been the definition of the information model; this is extremely important when designing dynamically scalable hypertext systems. We have imposed an a-priori organization of information, in a way that new nodes can be immediately classified in any pre-defined category (and added to the right place in the network). This is a condition necessary to guarantee a consistent growth of an on-line informative hypertextual network. It should be noted that a precise and rigorously defined model of the information is not a limit to the hypertext flexibility, rather it represents a "sine-qua-non" condition for its scalability and management.

The information domain reflects the methods of access to the information. Access to the Analysis Area has been provided according to three different reading keys specific to the information domain. Users can get access to the

pages through three different Indexes which refer to three different "categories" of information: chronological, topographical and typological.

These three information categories have been used to classify the hypertext nodes and they divide the information space into three logical sub-domains; each sub-domain corresponds to one of the three access methods, and can therefore be entered through a different index. Each node is put into a specific "class" belonging to a category; a single node can be classified according to multiple access criteria and, as a consequence, it can belong to several classes of different categories. In order to obtain a more refined classification, categories have been in turn divided into sub-categories.

Since the user can choose how to enter the Analysis Area, depending on his/her interests and the different aims of his/her research activities, different navigation paths are available through the nodes of the hypertext collected in the different sub-domains.

It is possible to conduct the research from pages that describe the development of the city of Palermo over the centuries (chronological access), or the present state of some part of the city in which it is possible to operate with an architectural project -e.g. the sea front- (topographical access), or the condition of particular buildings, streets, squares of the city (typological access). For example, through the chronological index the user can access the historical period in which the research must be carried out and, afterwards, the class in which the subject of the research is collected (e.g. historical period: Palermo in the XVI century; street: Via Maqueda).

In particular, through the Chronological Index, the users have access to an animation based on an ideogram that chronologically represents the growth of the city of Palermo and that automatically activates a series of icons. These icons, which represent historical plans showing the modifications of the urban structure over the centuries, are real access keys to the information. By selecting an icon, that represents a "class" of the Chronological Index, users can choose the subject of the research by consulting a list that shows all the documents referring to that particular class.

The Topographical Index allows users to have access to a map of the city divided into different areas. By clicking on each area -the sea front, in particular- the users have access to a map on a larger graphical scale.

These areas represent the "sub-categories" of the Topographical Index. Starting from these areas users can activate the links to recall the specific web pages, related to the particular area of the map. These pages may deal with the history of particular buildings of the city (or streets, or squares, and so on). Consequently, some pages can be collected according to all the three indexes; it will be easier for the users to search for specific information related to a particular building (or street, and so forth) of the city in a historical period, since it is reachable through all the three indexing mechanisms.

Working with the information: the "Licence Bar" and the "Tools Bar".

A "Licence Bar" allows system known users to add new pages and new links to the information base, so that the hypermedia network can be extended by the users. They can add text, images, drawings and movies by simply filling a form which is recalled through the New Page tool of the Licence Bar; during this operation the user can decide to create links to other pages (in the system or external web pages).

Information nodes which are added by the users can be easily classified and, consequently, located by other users. In fact, when users create a new page,

the system asks them to identify the class (or classes) the new page belongs to. Users can select one or more classes the new page belong to, and the page will be listed in the navigational indexes. Otherwise, the user can ignore classification of the page, which will be automatically linked to the page the user was visiting when the new page was created. In this latter case, the page will not be listed in the indexes, even if it is still classified in the same classes as the original page; it is treated as an appendix page.

The "Tools Bar" allows users to handle the information in the Analysis Area, to carry out operations on the information pages to maximize the learning process, and to recognize all the phases of knowledge acquisition. Changes to the page content performed with these tools are known only to the user who makes the modification. The philosophy of these tools is, in fact, the provision of a mechanism for individual study strategies.

The "Tools Bar" represents a particular set of "virtual stationery items" students can use to mimic traditional study activities while working on the Web.

For example, the "Marker" tool allows students to highlight images or parts of the text on the pages; the selected parts remain highlighted for the duration of the on-line module the student is registered with. During first reading, the user can "mark" each page of the system s/he considers relevant to his/her study by using the "Page-marker" tool; the user can navigate back to the marked pages through the "Iter" tool to study these pages in more detail (Unlike the "history" tool available in most of the commercial browsers, the "Iter" tool keeps track of the operation performed by the user on the pages). The "Note" tool allows user to add notes, reference-marks and other information to the text of a page. The notes, which are for the private use of the user who created them, remain "attached" to the pages from one on-line work session to another. The tool "Iter" highlights the presence of notes on the pages. The "Kit bag" tool represents a kind of catalogue that users carry with them during navigation through the Analysis Area and where they store pieces of information collected on this way around; furthermore, users carry the "Kit bag" with them in the Design Area together with the "Note Book" tool, where they can write down -during navigation- reflections, critical notes, and so on.

These tools are always connected to the pages, if the users are known by the system, together with a mail box and a chat room that it is possible to activate along the navigation route through the web pages of the Analysis Area (Fig. 1 – Screenshot of the system).

It should be noted that the system allows operations to be carried out using these tools depending on the type of user. In fact, even if the Analysis Area is public, the "privilege" to use these tools to manipulate the information of the pages (by the Tools Bar) and to extend the hypertextual net (by the Licence Bar) is granted only to the system known users. We have distinguished 5 categories of users and provided different access privileges for each of them: the system designers, the on-line tutors and the system administrators, that together represent the first category, teachers, students, expert guests, guests. From the first to the last category the privileges are progressively reduced. However, the privileges can be established every time a new on-line course is started, according to the specific requirements of the course.

The tools of the Design Area

The Design Area is directly aimed at some important phases of the design process; it provides Web-based synchronous and asynchronous communication tools (e-mail, electronic discussion forums, video-conference system, chatting) and includes tools to support the "control" of the project (virtual galleries, shared blackboard).

This area does not contain design software, such as CAD software, even if it allows users to configure direct links to their own software. In fact, the computer-supported design and rendering activities are performed by the students on their computers (or on the computers they can use at university laboratories). Communication and integration between the different projects are guaranteed by the standard format of the resulting files.

The "Shared Blackboard" and The "Virtual Gallery" can specifically promote teaching and learning of Architecture through the Net. In particular, by using these tools, students have the opportunity to publish their projects ("Virtual Gallery") and correct them through the "Shared Blackboard" in which teachers can graphically suggest corrections or design solutions: in this way, students have the opportunity to assess the progress of their own design activity, to reflect on their work and adjust it according to feedback from teachers, tutors and other students.

Students gain access to the Design Area through their Home Page, corresponding to a personalized access point to the system; from this page, in fact, they can enter the Analysis Area, or have access to all the available communication and working tools. Finally they can read the assignments for the course and find out about new information added to the system by other users (students or experts) from their last connection (new pages in the Analysis Area, new projects in the Virtual Galleries, and so on) (Fig. 2 – The student's Homepage).

Conclusions

In Web-Based Instruction (WBI) environments, the generic advantages of the web are exploited so to activate important cognitive and meta-cognitive processes which promote active learning.

One of the most interesting aspects along these lines concerns the collaborative activities that are facilitated by the communication tools and the sharing of information integrated in a WBI environment. In fact, the Web offers extensive opportunities for collaboration and cooperative learning.

Of the learning mechanisms that are possible on the Web, creative thinking and problem-based learning are extremely important in the case of the design in Architecture. In fact architectural design is an extreme case of project-based learning, in which the project to be developed is both the didactic objective and the means through which it is possible to activate specific strategies to learn how to design. The Web has proved to be extremely effective in supporting such activities [Collis 1997]. Consequently, the WBI environments can support the preparatory phases of the project in Architecture, including some extremely important creative phases.

The structure of the system allows users to perform different types of activities in the same web environment. The operations that the authorized users can

carry out on the web pages of the Analysis Area, through the "Working tools" of the "Tools Bar", represent an important feature of the system which has been developed improving cognitive access to the WBI system and supporting flexible and effective study activities.

It should be noted that some of the activities described could already be performed by using features of the browsers and of the most popular operating systems. However, these solutions are unsatisfactory because the mechanisms are not integrated into a single environment, they are usually separated from the learning context and require a cognitive overload on the part of the learner.

On the contrary, the developed WBI system does not require any particular cognitive overload on the part of the learner, only producing an intense level of cultural competition between the students of Architecture and Civil Engineering.

Finally, there is a practical reason which leads us to consider using New Technologies at university level, which is perfectly summed up by A.J. Romiszowski [Romiszowski 1997]: "new technologies, on the one hand, offer us tools with which to deal with the new challenges that a changing society or workplace presents and, on the other hand, those same technologies actually are responsible for the changes that are generating these new and ever changing challenges". Consequently, the competencies that are required by tomorrow's architects and professionals require efficient and rapid learning of the use of new tools and techniques that are constantly appearing in the job environment; therefore, it is extremely important to introduce the use of new technologies in the future architects' curricula from their university study.

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