AulaWeb: An integrated system for e-learning and e-management of educational centres

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ABSTRACT: AulaWeb is an integrated system that allows managing and offering courses from physical or virtual educational centres. This system has several features that allows: to give teachers information about the progress of their students; to promote interpersonal communication that makes possible the interchange of information, dialogue and discussion between all the people implied in the learning process; to make possible the collaborative work between the students with different applications for sharing information and working with common documents; to carry out all activities related to the academic management like the creation of studies, courses, subjects, academic files, establishing access privileges, creations of groups or the access to the information of the student; to create evaluation exercises that provide both the information on the knowledge acquisition and the effectiveness in the design of the education process. An example of this system in the context of the subject of Pattern Recognition shows these features in a real application of this system.

KEYWORDS: e-learning, e-management, virtual university, virtual campus, web based tools for education.

1. INTRODUCTION

Distance education is, despite of an existence of more than a century, a modern formative modality in permanent evolution, incorporating to the traditional didactic material the latest technological advances to help the students and facilitate their learning.

The importance of distance education in the world is evident. The distance education industry is set to mature further over the next few years, as the number of colleges and universities offering these courses increases from 1,500 in 1999 to over 3,300 in 2004. A new report [1] from the International Data Corporation (IDC), 'Distance Learning in Higher Education: Market Forecast and Analysis' states that the number of students enrolling in distance learning courses will jump by 33 percent per annum over the next four years. Within this field, the Professional Formation, the Occupational Formation and the Permanent Formation approximately suppose 40% of the total, showing a clear example of their validity.

Traditional distance education uses different means to provide content (mail, telephone, recorded tapes, videos, etc.), but Internet has introduced in this field the facility of the interaction with the student, multiplying the effectiveness of previous approaches and creating the new field of electronic learning or e-learning [2]. Now it is possible to offer a great amount of information in systems thorough the World Wide Web over IP based networks, that can be updated very easily and, in addition, to maintain an easy relation with the student through the electronic mail, debate forums, chat systems or electronic conferences and all this can be done with very reasonable costs due to different tools that Internet offers [3].

Some characteristics that describe the facilities and advantages of distance learning are the following:

- It guarantees an effective equality of opportunities for those who, by personal or social circumstances, have greater difficulties in adapting to ordinary education.
- It renders less need for physical proximity of learners to learning materials, other students, and teachers. This is of special importance in a fragmented territory like the Canary Islands.

- It fills the need for continuos learning in the knowledge-based society.

Within the University, e-learning can offer a very interesting complement to the actual lessons or increase the possibilities of selection of courses in the new university system. And from a wider point of view, it can be used to satisfy the cultural necessities that have groups of people who have interest in diverse formative aspects.

Virtual education in the University is mainly based on the Virtual Campus paradigm [4]. This allows by means of computers and telematic networks, to surpass the barriers of space and time and facilitates the individualised and interactive contact among all the members of the university community: students, professors and personnel of management. It is a powerful space of communication and transmission of knowledge and a clear place of academic and personal relation, where diverse services are offered.

In this paper we will present the AulaWeb project that has been developed in the Department of Estadística, Investigación Operativa y Computación in the University of La Laguna. It is based on the Virtual campus paradigm that provides and integrated system for e-learning and e-management both in the University and in other educational centres.

2. THE AULAWEB PROJECT

It is now widely accepted that education is essential to assure competitiveness in the knowledge economy, each time more global and interconnected. This is of special importance in the Canary Islands where economy is mainly based on the services sector. We hope that an opportunity can be found to get into the knowledge revolution now that the industrial revolution was lost due to the lack of raw materials and distance to the main markets. This has been recognised by the Canary Islands Government that promotes through the "Canarias Digital" plan the creation and use of new technologies. Due to the fragmentation of our territory and the formative needs of its habitants the use of distance education through Internet may be a valid solution to increase the competitiveness of our workers and companies.

During year 2000 the AulaWeb project has been developed as an integrated online learning environment designed to simplify the creation and management of online learning. The intention being that the system will be used to enable the use of online learning within and outside the University. This paper will describe the guidelines driving the design of the system, examine the individual components that make up the system, discuss some of the issues involved in building and using the system and provide examples of the use of the system by teachers and students.

The Aulaweb system is not the only online learning environment currently available. There are already a number of similar systems with varying capabilities including:
- Web Educational Support Tools (WEST), http://www.west.ie/
- World-Wide Web Course Tool (WebCT), http://homebrew.cs.ubc.ca/webct/
- Web course in a Box (WCB), http://madduck.mmd.vcu.edu/wcb/wcb.html

and also several prototypes are being built [5]. The decision to develop another system does not indicate that existing systems have any major flaws. However the Canary Islands situation offers many unique perspectives including the combination of university formation, professional formation or company formation and a general population with significantly low computing expertise and access to technology. In addition, there are Department staff and companies with research interests in the Internet and the application of information technology to learning.

These and other circumstances combined with the idea of not being only receptors of technology but creators of tools and learning systems has been in the beginning of the project. Moreover, the relative youth of e-learning means that there are new features and methods that have not been used or even thought of. The design, implementation and use of a proprietary online learning environment will provide an opportunity to experiment with new services and enable a comparison to be drawn between different systems and hopefully identify even more possibilities.

2.1 Design guidelines

The AulaWeb e-learning environment is being driven by a number of design guidelines that are discussed in the following paragraphs. In short, these principles are:
- Conceptual design based on the virtual campus paradigm.
  Physical campus has been a valid form of university organisation where a number of services including learning and management are centralised. In the virtual campus design, Aulaweb stands as a virtual metaphor of the physical campus providing a centralised place where all the learning actors interact (see Figure 1)
- Platform independence and implementation based on standards
  Platform independence is especially important since students could be using an IBM PC running Windows 98 or 2000 or NT, or any one of a number of UNIX platforms. Using a tool, such as ActiveX, which is not available on certain platforms means that some students will miss out. Platform independence will not be limited to client

software but will also be a criteria for server software. Platform independence not only increases the potential user base but also increases adaptability to future industry developments. This independence is based in AulaWeb in open standards like HTML or PHP.

- Minimise skills to use the system
  This is of special importance due to the low penetration of new technologies in studies that do not belong to the Computer Science Area
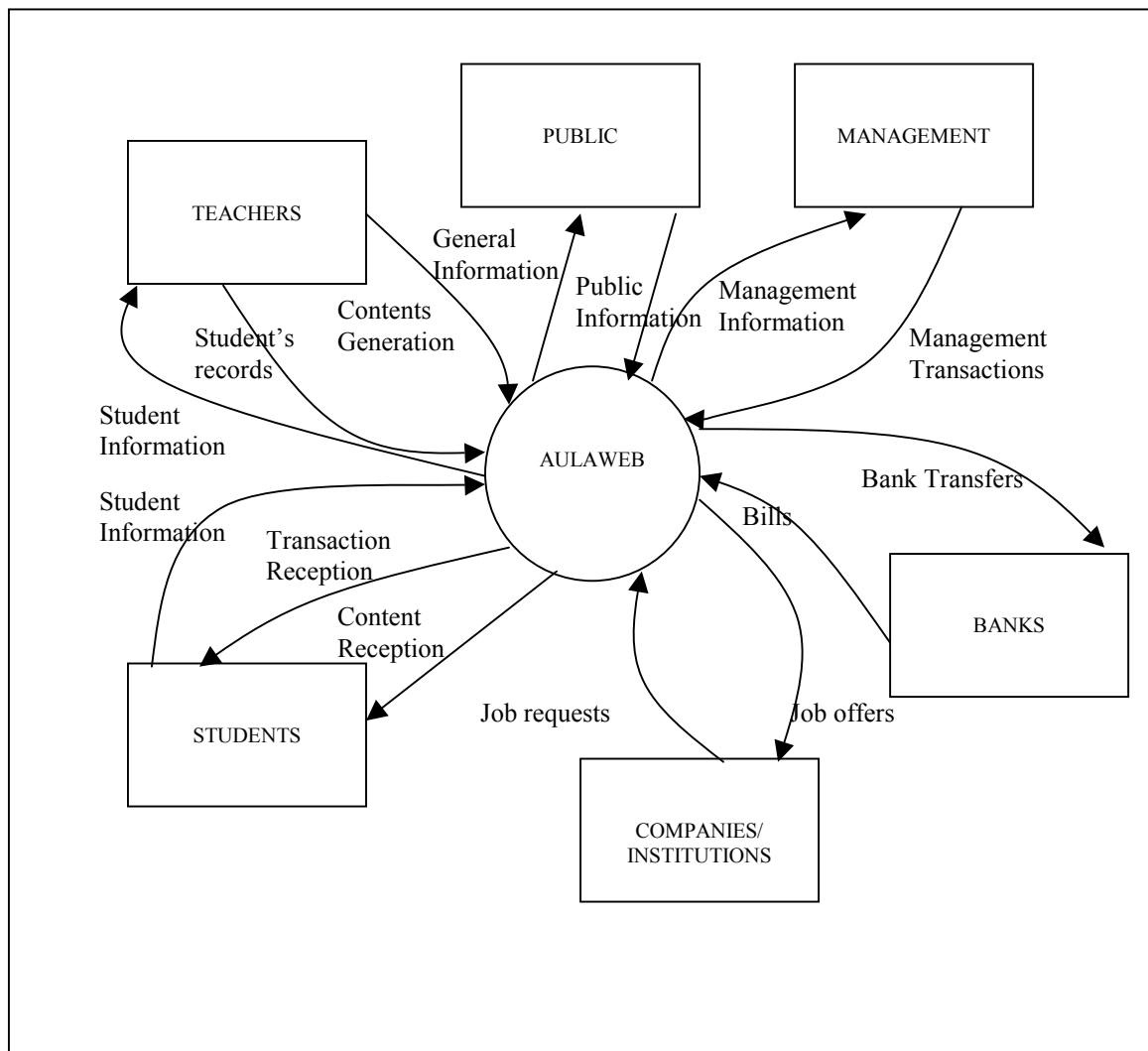
Figure 1 Information flow in the Aulaweb system

2.2 Components and features

The following section examines the components and features of the AulaWeb online learning environment. Its main modules are the administrative management module, the learning management module and the student module. The main features are:

- Administrative management module
  - On line course registration
  - On line course payment
  - Virtual certifications
  - Course creation and management
  - User creation and management
  - Resources management

- Virtual desk with the following tools:
    - Electronic mail (pop3 and web-mail).
    - Debate Forums
    - Chat System
- Student Record Manager where administrative information can be updated (see the left of Figure 2)

• Learning management module, with two different figures: Co-ordinator, who is responsible of learning management and Teacher-Teaching Assistant, who take care of student's formation. Both have common tools of administration and management of their corresponding fields that is based on a:
    - Virtual desk, integrated with the following tools of communication:
        - Electronic mail (pop3 and web-mail).
        - Debate Forums
        - Chat System
    - Virtual storage, where files related to the course are stored.
    - Virtual Professors Room, where to share all type of telematic resources.
    In addition, both have to be able to manage the users that previously assigned by the administrator from their personalised desk
    - Content Tools:
        - Course Integrator: that permits to use previously created coursed under other tools.
        - Course Publisher: Content creation tool integrated in the platform.
        - Exam Publisher: Tool that make possible the automated creation of examinations of several types: multiple selection (with one or several possibilities of success), true / false or open questions.
    - Student Record Manager where learning information can be updated

• Student Module: Virtual desk where to take the course with:
    - Communication tools:
        - Electronic mail (pop3 and web-mail.)
        - Debate Forums
        - Chat System
    - Study tools: related to the content of the course or courses in which the student is registered.
    - Examinations: where course tests take place.
    - Evaluation and self-evaluation tools, to be able to measure the progress in the course, as well as to be informed of course qualifications
    - Identity Management: where personal data such as identity and / or password can be changed.
    - Space of virtual storage, where upload and download course files
    - Mobile desk: the mobile version of the virtual desk (see the right of Figure 2).

This relation of features is not exhaustive and has been designed having in mind that one of the characteristics of the Internet is that it never stops changing. This means that flexibility and adaptability are essential features for any e-learning platform.
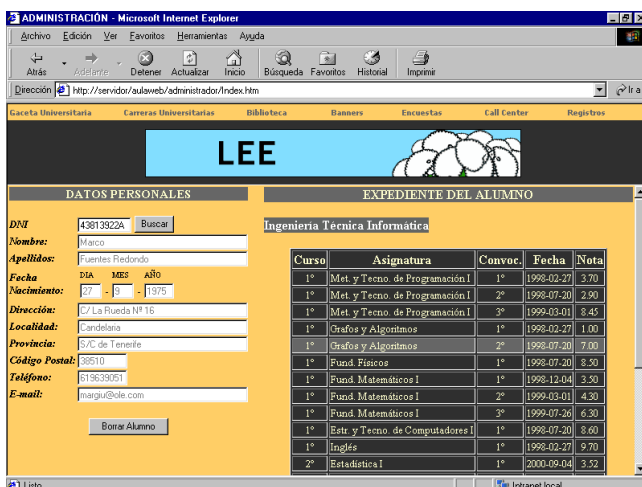

Figure 2 Student record (left) and mobile desk (right)

3. A COURSE EXAMPLE

In this section we present an example of the use of Aulaweb to develop an interactive hypermedia environment that enhances traditional education at University level. We have chosen the field of *Pattern Recognition* because content can be greatly enhanced with visualisation tools and it is an important and well-defined part of Artificial Intelligence. Currently the teaching and learning environment contains:

- The course slides (150 slides, postscript)
- Course textbooks and slides from other Universities (postscript)
- Animations and simulations (about 10 in Java)
- Problems and exercises
- Previous exams
- Practical problems for programming
- Libraries for programming
- Organisational and administrative information
- A collection of links related to the field
- A collection of book references

Producing a hypermedia courseware (see Figure 3) for a complex field like Pattern Recognition that goes beyond what traditional education offers is very difficult if everything, in particular animations and simulations has to be developed from scratch. Therefore we systematically started to collect all kind of material either offline and online to either download it or use it as an interactive text. This generates the problem of the integration of such diverse material and of course the copyright issues that is of great importance [6].

The method for online course preparation has been done by collecting scientific material from various sources (textbooks, articles). This material is consulted, condensed and translated to produce the material that is available to students. As this course has been given before we have reused a lot of material that was in digital form with minor modifications to keep up-to-date.

The result is a centralised place for the *Pattern Recognition* course that makes easier for the students to obtain teaching materials with a decrease in the time, energy and cost involved in education. Moreover the use of on-line learning increase the student/student and student/teacher communication which is of crucial importance on their success and satisfaction.
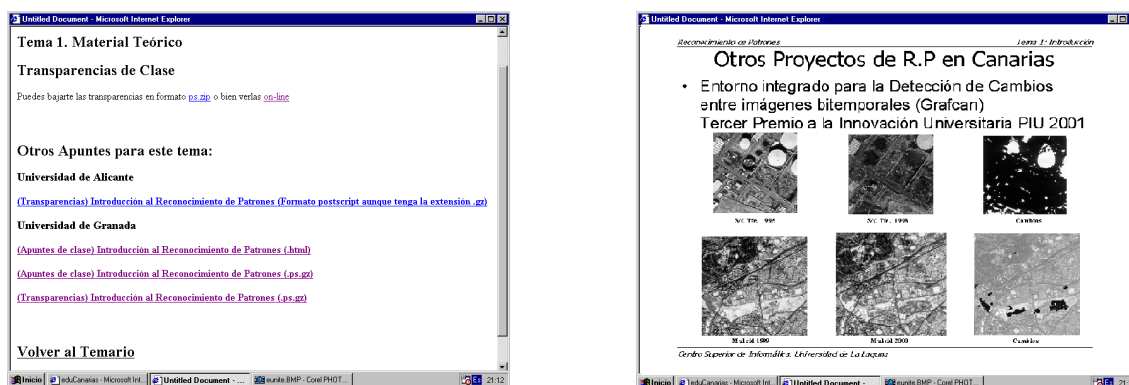
Figure 3 Hypermedia course for *Pattern Recognition* in the Aulaweb System

4. CONCLUSIONS

On-line learning can supply a number of significant advantages over traditional teaching methods. An efficient use of e-learning requires the support provided by an integrated system that supports the interaction between all the learning actors in the educational process. AulaWeb is an integrated system based on the virtual campus paradigm that is designed as a central point that distributes the information between all the elements that interact in the educational process. The system is based on a flexible design and provides a set of tools for the management of all the aspects of learning: from course creation to digital certificates. An example of the system for a University course is provided that

shows the system in a real course. It is hoped that Aulaweb will promote e-learning and the use of new technologies on our community.

5. REFERENCES

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