BIMODAL EDUCATION: Pilot Project at the University of the Basque Country

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Abstract: This paper presents an experimental project at the Engineering School of Bilbao. Its main goal is to design, develop and validate tools in order to reinforce a bimodal continuing education model according to the emerging trends to provide higher education over Internet to different academic and professional groups.

Keywords: On-Line Education, Asynchronous Learning, Distance Learning, Video Streaming, Internet Broadcast, Broadband Applications, Performance Analysis

I.- INTRODUCTION

Education, as the action of teaching and developing intellectual faculties of people is a concept as familiar as complex. In the last two decades the education world has witnessed the computer and communication revolutions, which have been the main catalysts of the evolution in the educational models. This evolution has been accomplished in all areas, and with special intensity in the university environment.

The traditional model based on magisterial lectures in a particular time and space, now shares the audience of students with others alternative models. The new communication and information technologies allow new scenarios defined by the time-space matrix. The virtual campus is the implementation of a real university campus in a virtual environment and it provides the education on demand, anywhere and anytime.

The Bimodal Education model [1] is an adaptable model where simultaneously coexisting traditional activities such as magisterial lectures, laboratories, tutors, etc., with the possibilities provided by the communication and information technologies such as presence, interactive classroom, real time video, videoconferencing, virtual class, etc. cooperate in order to improve learning-teaching quality and to address the wide professional groups that demand continue access to education.

The majority of virtual campuses base their course content in text courses. These can be improved if the content courses were based on the lecture videos. The lecture performance allows the students to have an adequate content temporization and a better content understanding provided the teacher. Also, it is a means of making good use of

the bimodal resources. Several universities, colleges and faculty libraries deliver contents in video format [2,3].

However, this approach requires new educational methodologies and not a simple broadcast of traditional lectures; the reutilization nature of the lecture video implies that the activity of the class content should be well organized, and that the content creation addresses the needs and features of the new media.

The work presented in this paper is part of the work being implemented in the University of the Basque Country UPV/EHU in the area of education and cyberspace [4,5]. This work tries to incorporate to the new teaching methodologies the features and services of the current and future Internet.

II.- VIDEO ON DEMAND DELIVERY

In the past few years the video delivery over the Internet has offered a modest quality level. Technically, the recent developments of narrowband, real-time, video applications using the Internet as the transmission media have opened a new area in packet-switched communications: (relatively)-high bandwidth and low delay streaming applications [6,7] making possible the successful delivery of on-line courses with this format.

The internet multimedia technologies have developed a new approach to allow playing video content in real-time: Streaming media. Streaming media is a method of making audio, video and other multimedia available in real-time, with no download wait, over the Internet or corporate intranets. RealNetworks™ is the recognized leader in streaming media technology [8] and offers software products to send and receive audio, video, animation and other multimedia services over the Internet. Streaming media systems consist of the following five elements:

1.- Encoders & Tools: used to create or capture and edit multimedia from different sources, such as video, audio, animation, text, images, etc.
2.- Data Types: the source information is converted in different data types
3.- Servers: computer with the sever software performs the transmission of the data
4.- Networks: medium over the networked computers are connected
5.- Client Players: receptors of the data in live or on-demand form

The implementation of a streaming media system appears in Figure 1. The first step requires: the creation of content (i.e. a lecture in a classroom) using standard video cameras/microphone; the digitalization of video signal by a capture card; and the compression of digital signal into either a streamable digital file, to be edit later, or live stream for live broadcast by the Encoder software. The file or live stream is transmitted over the network to a computer with the Server software installed, and finally the video of the lecture is accessed on a live or on-demand basis by multiple end-users with the Player software on their personal computers.

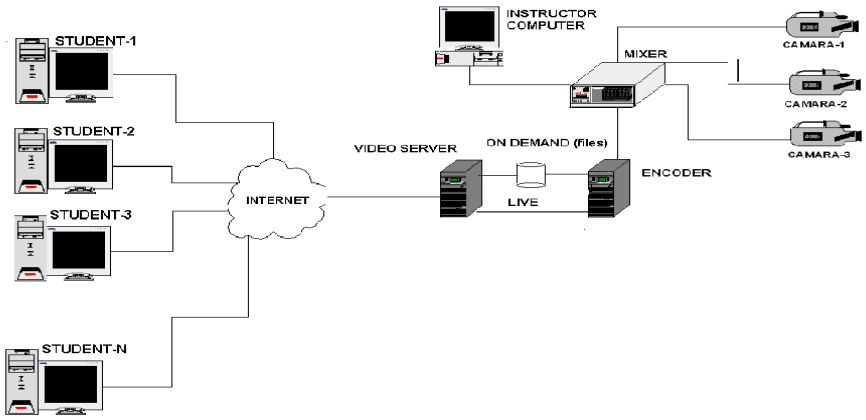

Figure 1. Video Stream Delivery System

The three basic steps in this approach are: a) create the streaming media; b) broadcast the data types; and c) play data in end-user's computer. The lecture event in the classroom is recorded by a set of several cameras. An operator selects the appropriate video input based on the activity of the professor. An additional video signal was obtained from the instructor's monitor to provide access to his notes or his use of computer programs in class.

The Encoder software requires the selection of different options of the compression parameters, such as bandwidths and the size of the video screen. For different network connections i.e. 28.8kbps or 128kbp, the size of the video screen can change from 176x144 pixels to 320x240 pixels, and the frame rates of the videos from 8 frames per second to 15 fps respectively. The player views the lecture at the size that provides the best video quality for the bit-rate at which they are encoded, and increasing the size of the video clicking on the bottom 'view' and select 'zoom' will degrade the quality of the image. The Figure 2 shows the Encoder software options to compress the digital video signal. This encoder is the encoder software of RealNetworks.

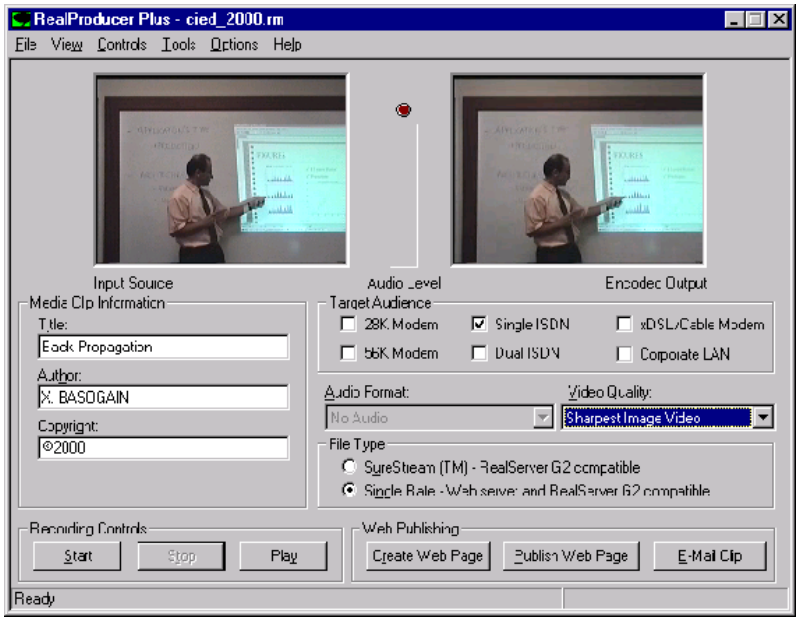

Figure 2. Encoder software window

III.- EDUCATIONAL ENVIRONMENT SOFTWARE

There are different software packages to help the instructor construct and maintain a useful learning environment using the Internet to teach [9,10,11]. WebCT software [9] can be used to create entire courses on line or to complement a classroom-based course. Some of the features of WebCT include the following: a) providing course materials that include text, images, video and audio; b) communicating with the students via discussions, email, chat and whiteboard; c) evaluating students with quizzes and assignments; d) supplying students feedback via an online gradebook, self test and progress tracking; and e) improving learning using searchable indexes and glossaries.

WebCT software resides on a server and using a web browser, such as Internet Explorer or Netscape, users can gain access to it. In addition it enables the instructor to make changes to his/her course readily from any point of the Internet and to make these changes available to any user at the same time. WebCT is a tool built by instructors for instructors at the University of British Columbia. The WebCT software is a leader in the Web-based learning marketplace, it has more than 6.7 million student accounts in 147,000 courses at more than 1480 colleges and universities in 57 countries.

This software offers a set of tools designed specifically to accomplish different goals considered in a course design. Table 1 summarizes the tools with a brief description of them. The instructor customizes the course adding the required tools according to the goals to obtain.

Tool	Description	Group
Assignments	Tool to create and distribute course assignments to the students, and download, evaluate, and assign a grade to the completed work	Evaluation
Calendar	Tool to post dates, and provide information about course-related events. You can include links to course content and to relevant websites.	Content
Chat	Tool to have real-time conversations	Communi cations
Content Assistant	Tool to search or browse the e-Learning communities to find content for the course.	Content
Content Module	Tool to create and organize course material such as lecture notes and assignments. To assist students with their studies can provide additional tools such as learning goals, references, glossary entries, and multimedia presentations, all within a Content Module	Content
Discussions	Tool to create topic areas for discussion. Topics can be public or private.	Communi cations
Glossary	Tool to create a fully searchable glossary of terms	Content
Goals	Tool to provide students with learning objectives for a Content Module	Content
Image Database	Tool to create databases of images for the students	Content
Mail	Tool to send private mail messages to each user.	Communi cations
My Grades	Tool to view the students their own grades for the course	Evaluation
My Progress	Tool to see the parts of the course the students have accessed	Study
Quiz	Tool to create and administer online quizzes and surveys	Evaluation
Search	Tool to conduct a search for text within any course	Content
Self Test	Tool to create a multiple choice test that students can use to gauge their knowledge	Evaluation
Student Homepages	Tool set the students need to create a personal Web page	Study
Student Presentations	Tool for the groups create their presentation in HTML as linked web pages	Study
Syllabus	Tool to create a customized course outline. Contains pre-defined sections such as course information and instructor information, and allows you to add custom sections	Content& Basic
Whiteboard	Tool to draw during an online discussion	Communi cations

Table 1.- List of WebCT tools

This software has several utilities to ease the management of different functions of an online course, such as Manage Files, Manage Course and Change Settings.

IV.- PILOT PROJECT

Since 1997 the multimedia research group at the Engineering School has been working in multimedia and Internet technologies. The first works were in the area of network video transmission and the modeling and simulation the traffic data generated [12,13].

After a gaining valuable experience in this area, the group focused its research goals in the area of online Education integrating video transmission and educational environments over Internet. Recent works and the actual project [14,15] are creating the infrastructure that will allow the implementation of several projects in this area. The main goal is to design and develop the technologic infrastructure (hardware, software and communications) and the academic infrastructure (course materials, teacher-student communication) to delivery two courses of the third engineering cycle over the Internet according to the bimodal approach. This bimodal approach constitutes the first experience of this type at UVP/EHU.

The courses selected [16] provide adequate characteristics to this approach: a) reduced groups of students; b) professional profile and continuos formation; c) availability to use new educational methods and technologies; and d) rich content courses using computer-based tools.

The WebCT software has been customize to allow student access to all lecture videos, course materials, communication tools, evaluation and study tools. Figure 3 shows the main window of a course at Engineering School online courses sever [17].

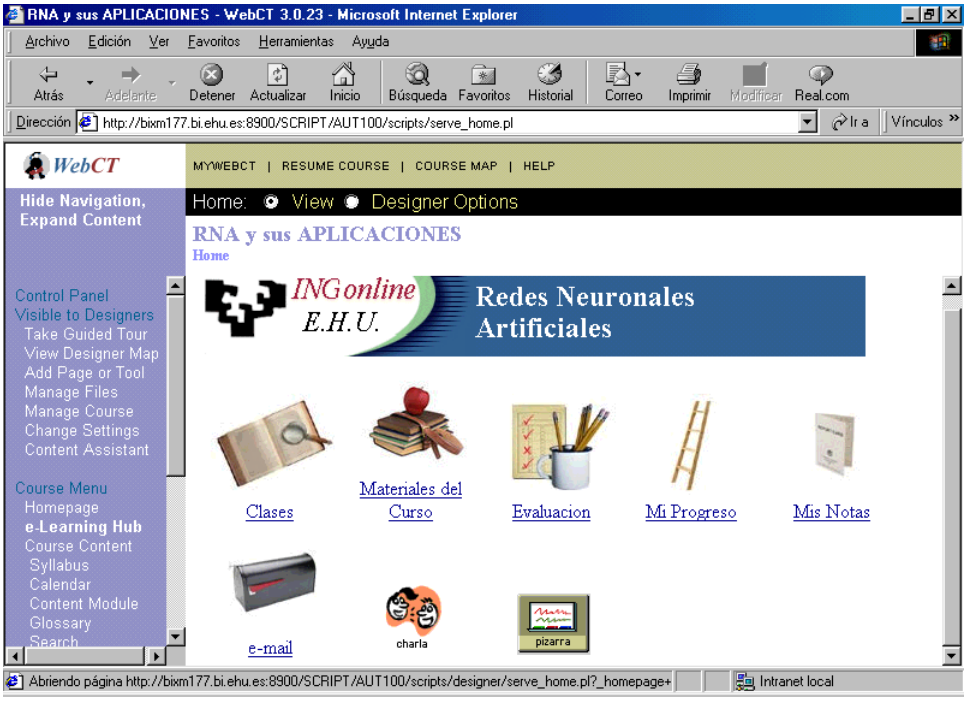

Figure 3.- WebCT at Engineering School of UPV/EHU

Once the student has accessed the homepage of a specific course she/he can select a page with links to the all available lectures on the video server (lecture videos generally require several hours of post-lecture production and are posted shortly thereafter).

The design of the lecture video screen has three parts, class window, index window and slide window, as is illustrated in Figure 4. The former is at the upper left corner and students see and hear the professor presenting the lecture. The index window allows the student to address the part of the lecture desired. The large window corresponds to the slide zone. The design aspects of the screen have been selected considering many technological, audiovisual and pedagogical characteristics in order to facilitate the learning process.

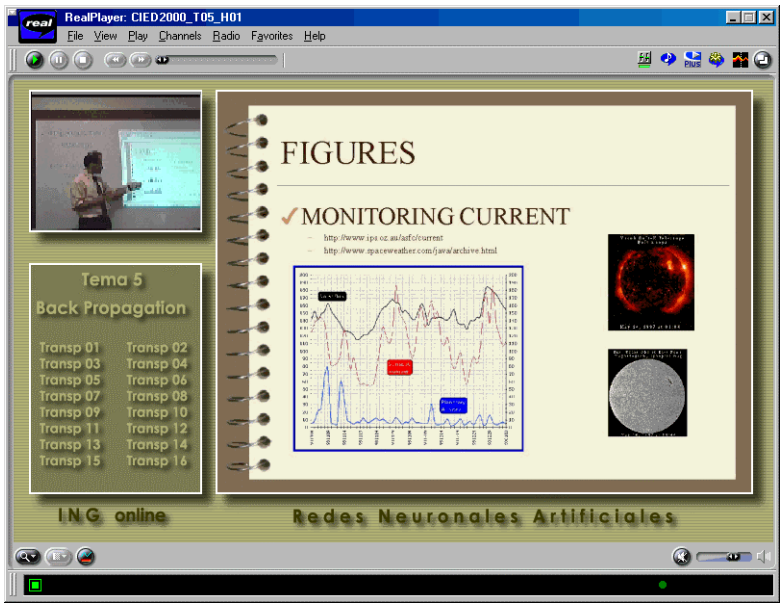

Figure 4.- Lecture Video Screen

An additional goal of the project is the performance analysis. The perceived quality by the user is a subtle and subjective metric; it requires a definition of different aspects to quantify the quality in technical terms. In this sense, the criteria proposed by evaluation systems of virtual campus to be considered is described in [18].

There are different groups of student with several types of connection (modem, ADSL, LAN, etc.) in order to evaluate different network performances. The results and conclusions from the performance analysis will help address the future efforts in this area.

V- CONCLUSIONS

This paper presents the work developed to support the Internet delivery of two courses in the bimodal education context at UPV/EHU, and reviews some of the technical and academic aspects critical in the successful operation of these environments. It describes the technological structure to allow video streaming of the lectures and the academic educational environment. The performance analysis of this pilot project will allow the evaluation of the proposed system as an initial step of a larger project to extend to this methodology others areas of UPV/EHU.

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