A proposal for distance education: IKASTEL

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Abstract

Terms such as "Virtual Campus" or "Virtual Faculty" are currently being used to refer to the development of educational activities using telecommunication resources that provide powerful mechanisms for distance learning. Traditional universities follow a "synchronous" teaching model, where instructor and students join together in the same space (the classroom) and at the same time (that given by the timetable). In order to translate this scenario to a distance learning environment, tele-presence systems are required; examples of those are videoconferencing systems, and many classes of groupware. The implementation of such systems is of special interest for traditional universities, because it is a way of broadening their area of action by means of removing the distance barrier.

1. Introduction to the *virtual faculty* or *virtual campus*.

Terms such as Virtual Faculty or Virtual Campus are currently being used to refer to the development of educational activity using telecommunication resources which provide mechanisms for distance learning.

Traditional universities are based on a synchronous model, where teacher and students are at the same time (that given by the schedule) in the same physical space (classroom, laboratory, etc.). In order to translate this scenario to a distance learning environment a telepresence system is required, which facilitates the collaboration among teachers and students located in different places. This system can be built using computer applications for videoconferencing and collaborative work.

Some other universities are especially designed to provide distance learning by means of self-study systems. Examples of those are the UNED (Spain's National University for Distance Learning) and UOC (Catalonia's Open University). Those universities are targeted to those students that, due to reasons such as work or family organize their own study schedule. This is an asynchronous model where students and teacher do not gather in a classroom at the same time, except for events such as exams. These organizations' support systems include asynchronous tools such as e-mail, WWW, database access, etc.

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The virtual faculty concept is specially relevant for the traditional university, because it broadens their potential “market” by means of removing the distance barrier. Some universities are implementing experimental systems using the above mentioned telepresence systems, combining them with support systems like those used in the open universities. A wise combination of synchronous and asynchronous communication systems can give a superb support for educational activities.

At the same time, the use of these new systems can be considered a challenge for universities, because students will have a broader selection of them to choose from. This means that they will need to be competitive, and offer their services not only to the regions where they are located, but also to students for other regions—and even countries. As an example, nowadays most of the students of the Basque Country attend courses at the UPV/EHU (University of the Basque Country). In the future these students will be able to choose other universities (without moving to another city), and some students from other regions will be able to attend courses at the UPV/EHU.

2. The University of the Basque Country and the virtual campus

The UPV/EHU is distributed along three different campuses, plus a number of out of campus facilities. About 3,500 instructors work to give service to more than 60,000 students. This is a “traditional” university, using the “synchronous” teaching (learning) model.

One important policy of the UPV/EHU is to avoid, if possible, to offer the same courses in more than a site, so the educational offer is distributes around the Basque Country. As a result of this, thousands of students travel every day about 200 Km. in order to attend their lessons in a site different from their home cities or villages. The virtual campus would help reducing this daily commuting.

At the same time, the UPV/EHU is involved in a process of changing the organization of their courses, giving the students the opportunity to choose subjects from a broader set. A virtual faculty would allow students to attend classes from other campuses.

Finally, another reason to consider the virtual campus a good idea is the optimization of human resources. It is very inefficient to teach an elective subject to a very reduced number of students. The virtual campus would make easier to get the attention to more students, being this way easier to reach a cost-effectiveness. It is even possible to collaborate with other universities, to organize some join activities for students from any of them.

3. The UPV/EHU corporate data network

Recently the UPV/EHU has upgraded its previous data network. The current one (still) connects users to the network by means of 10 Mb/s Ethernet links. However, the backbone is built around ATM technologies, using 34 Mb/s links to join the three campuses. This (and the previously available) network has been used by our group (at the Computer Science and Engineering Faculty) for videoconferencing experiences since 1993.

4. Distance learning systems

A distance learning system targeting the virtual faculty has these main components: (1) communication infrastructure and services, (2) user terminals, (3) contents and (4) a methodology. The first two components are related to the information technologies, while the others are closer to the pedagogy field.

Regarding the communication technology, traditional operators (PTTs) propose a system based on the voice network: point to point communication, maybe using the ISDN, with a poor cost/performance relation (compared to other systems).

An alternative model is based on the Mbone (Multicast Backbone) experience, built on top of the Internet. This is a more open system, using a multicast (even broadcast) model that is similar to the commercial TV or radio, but bi-directional. It is focused on group communications, using PCs and UNIX workstations as user terminals. Its main field od application today are corporate networks, and R&D networks. In Spain, RedIRIS (the R&D network financed by the government) encourages the use of Mbone for videoconferences between universities.

5. The IKASTEL project

The Computer Networks Group at the Faculty of Computer Science (UPV/EHU) is currently leading a project (financed by Spain's Ministry of Education and the Basque Department of Industry) called "IKASTEL: Facultad Virtual". A number of companies and R&D institutions form part of the project: AVA Multimedia, Softec, Tea-Cegos, Euskalnet and Robotiker). The project's aim is to develop an environment for distance learning, offering applications and systems for remotely attending classes. The first step uses a set of specially arranged classrooms. The next one is to allow students to attend lessons from their homes, using the POTS or the ISDN and a personal computer (see Figure 1).

The UPV/EHU corporate network provides the required communications infrastructure for these experience. Now it is time to develop educational software and *contents* in order to effectively encourage students to enroll in courses using the new system.

A first phase of installation, test and evaluation has already been performed. Some short courses have been offered from the UPV/EHU via the Mbone, and professors from this university have collaborated in similar experiences from other universities. The achieved results are very encouraging, showing the potential of these technologies: currently available systems are able to be operative and offer an acceptable (if not high) quality.

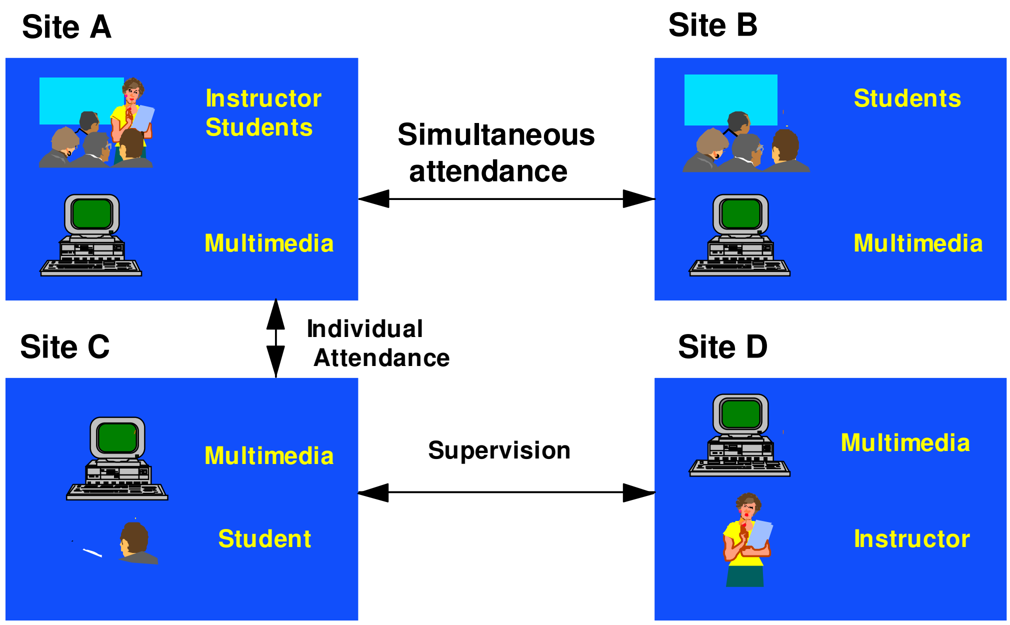

Figure 1. IKASTEL model for distance learning.

6. Required equipment

The equipment required to participate in a tele-education system depends on the role the user plays. There are two basic classes: instructor and student.

A student needs a personal computer, enhanced with connectivity elements (modem, ISDN adapter, LAN adapter) and a sound card (plus microphone and loudspeakers). This is enough to send/receive video and data, and to receive video. If it is required to send a video signal, a video camera should be added, plus a digitizer (which can be part of the camera or a separate card).

An instructor environment requires all the above components, plus hardware and software to prepare educational multimedia documents.

If it is intended to use a room to house many students while they attend a lesson given from a remote site, a PC or workstation is required, with audio and video systems of good quality. The generated image should be projected to a large screen. Special care should be taken with the sound signal in order to guarantee a good hearing quality and to avoid echoes.

7. Current tasks

In the current phase of the project we still are watching the technology evolution, not only on the communication side but also on the computer software: the market is continuously offering new applications.

The new corporate network has removed all our concerns about the communication capacity required by the system. It has enough capacity to cope with many sessions in parallel, without affecting the other users. The way to offer domestic reach to the system is a problem to solve, and here communication capacity *is* a problem. Some commercial systems are currently under study.

We are performing extensive tests of hardware/software combinations for the videoconferencing applications. Our intention is to allow the system to be operative on top of almost any platform (hardware, operating systems), while continuously enhancing its abilities. It should be stressed, though, that computers and networks are only the *means*; our real challenge now is to concentrate in the pedagogical issues, and to collect a good set of multimedia material to be offered as course contents.

In this moment we are trying to involve instructors from the UPV/EHU in the preparation of trial courses. This will help up to grasp a better knowledge of the system as a teaching tool, and to develop methodologies for preparing and offering educational material in the framework of the Virtual Faculty. The collaboration of experts from areas other than the information technologies is essential, and the implication of students too, in order to evaluate the effectiveness of the system, and its usability.

8. Conclusions

Tele-education activities will play a very important role in the future of universities. They will have serious economic implications in aspects such as reduction of commuting time (not only for the students, but also for professors) and reduction of faculty (sometimes less instructors will be required). They will help to group people (or distribute courses), making possible to gather enough people for a given course, thus reaching higher degrees of cost-effectiveness. It will also help students in rural areas to have access to higher education without abandoning their residence.

The technology is quite mature, although much work has still to be done in order to make it effective as an educational service. New methodologies and metaphors for the teaching/learning process have to be developed and integrated in this kind of systems.

References

Those interested in obtaining more information about this project, and a list of reference material, can visit the IKASTEL project's web page at:

"http://www.cd.sc.ehu.es/MultiMed".