

Development of Distance Learning in Croatia

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Abstract: In Croatia there is one large university in the capital Zagreb and several small ones. The small universities are constantly facing the problem of being understaffed, so professors from Zagreb have to lecture in other towns, thus having to travel frequently. We were faced with such a problem with the study “Signals and Systems” where lecturers had to travel to Osijek, which is 270 km away, every week. By introducing new technologies in the education this problem has been solved. All lectures were prepared in the form of presentation in Power Point and the simulations in Matlab. Lectures which are prepared on this way are adapted for distance education - videoconferencing. This paper shows the development of distance education in Croatia and the results of teaching by videoconference in the course of three years.

Keywords: videoconferencing, distance learning, new technologies

1. Introduction

Apart from the compulsory education during the schooling period there is a constant need for lifelong learning. This is mainly due to the rapid development of technology. Another important reason for analysing the domain of “technology in education” are the numerous possibilities and opportunities which have been introduced through the development of communication between people. People have always tried to take advantage of communication for educational purposes. Attempts have thus been made to substitute classical education in the classroom by various correspondence courses and such similar projects. Such a form of education where there is no direct contact between the person who is teaching (teacher, professor, lecturer) and the person who is being taught (student, pupil) is called distance education [1-3].

Croatia is a small country with a population of 4.5 million inhabitants, having one large and several small universities. The University of Zagreb has a longstanding tradition as it was established in 1669 [4]. The main problem of small universities is a shortage of staff and so the professors/lecturers had to spend a great deal of time travelling hundreds of kilometers from Zagreb to other towns and back in order to lecture there. We were faced with such a problem with the study “Signals and Systems”. The development of new technologies and the introduction of computers in the process of studying has solved this problem.

2. Introduction of new information technologies (IT) to the studies

In classical education numerous problems arise, such as the writing of complicated formulas, the drawing of schemes, the students copying from blackboard mechanically, etc. The specific problem connected to the study “Signals and Systems” is the problem of simulation of practical examples. We have attempted to solve these problems by introducing computers in the educational system. All the lectures have been conceived in the form of presentations in Power Point. On the slide there is a dynamic exchange of text, formulas, schemes, animations and video. It is a well-known fact that 20% of the curriculum is retained only through listening, 40% through both watching and listening and as much as 70% is retained when watching, listening and trial [5]. That is why we have concentrated on practical examples. We are using program Matlab for simulation. Lectures which have been prepared in such a way are adapted to multimedial distance lecturing, or the so-called videoconference.

With the help of CARNet (Croatian Academic and Research Network) the first interactive videoconference in Croatia between Zagreb and Osijek was held on January 27th 1997 [3]. During the first semester, the lectures in “Signals and Systems” were given from Zagreb by means of modest equipment: a computer, a camera, a projector, a microphone and a TV monitor (Figure 1). The same equipment was installed in Osijek. Such lectures were proven effective as the time spent on travel was reduced, whereas this time could be used for other purposes such as receiving advanced training, acquiring new technologies and introducing these into the process of education.



Figure 1. The first videoconference in Croatia

The Ministry of Science and Technology has helped finance the acquisition of a modern multimedial classroom for videoconferencing [6, 7]. It comprises 36 seating spaces thus making it possible for both students from Zagreb and those from Osijek to attend the lecture at the same time (Picture 2). One camera follows the students in Zagreb, and two cameras the lecturer. There is a microphone on each desk so that the students can take active part in the lecture and that they could be heard in Osijek. Two large monitors are located in front of the lecturer: one shows the students from Osijek and the other the presentation of the lecture. The lecturer can, of course, freely write on the blackboard (which is black in colour) and this can be zoomed and be transferred to Osijek when necessary. A cabinet with a computers, a mixing desk and the other technical equipment is located at the far end of the multimedial classroom. A system-engineer is in charge of the emissions and all technical problems that may arise.

In Osijek there are two screens: on one of them the students can follow the presentation of the lecture, and on the other they can see the lecturer and follow what he is writing on the blackboard. Apart from the two screens, in Osijek there are also two computers for a synchronized presentation with Zagreb by means of Net Meeting, one camera, two LCDs or a projector and microphones. The connection is ATM with a speed of 155 Mbps which has been achieved by means of optical cables. Such an equipped lecture hall enables high standard lectures, one major draw-back of which is that it is relatively expensive. This is the reason why one lecture hall is being used by the whole University. The investment into this project has very rapidly, however, payed back.



Figure 2. Multimedial classroom for videoconferencing in Zagreb

3. Working method

We are hereby going to describe in short the course of a videoconference as taken from a lecture on “Non-linear system of 1st order”, or the so-called “flip-flop”. The lecturer lectures about the flip-flop and changes the slides

which follow the lecture by means of a remote control mouse. When he reaches the simulation, it is simple to revert from Power Point to Matlab. The students are first shown the structure of the flip-flop in Simulink (Figure 3). Depending on the length of duration of the impulse at the input of the system, it is shown whether the flip-flop will succeed in transferring from one stable state into other. Figure 4 shows an impulse at the input of a specific amplitude where the following is being altered: the width of the impulse, the output from flip-flop $x = f(t)$ and trajectory $x' = f'(t)$. It can be seen that flip-flop has succeeded in transferring from one stable state into the other within the given width of the impulse.

The lecturer has a previously prepared script which he must follow carefully, but it is not unusual that new ideas are formed on the basis of discussions with students. The advantage of such a method is that is possible to try out simulations taken from various parameters on the spot.

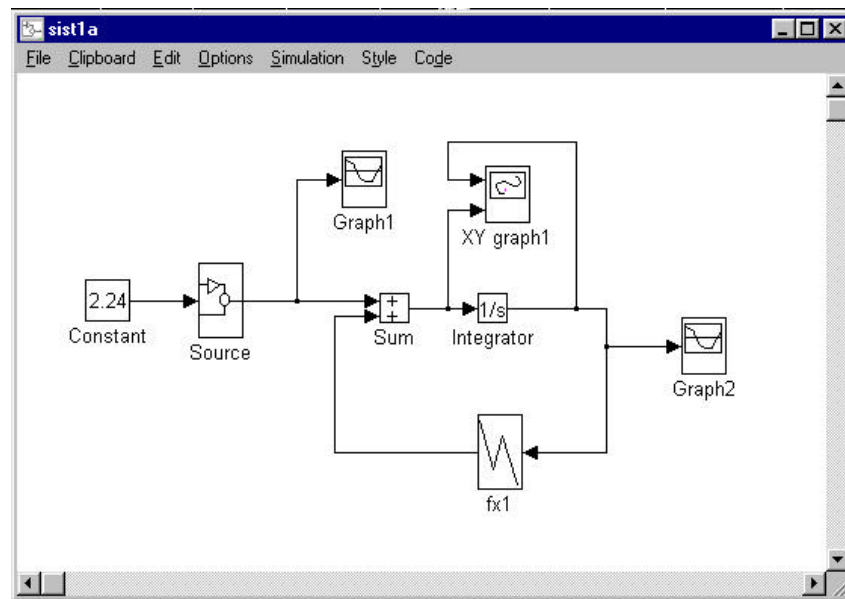


Figure 3. Non-linear system of the 1st order “flip-flop”

4. Results

Lectures which have been organized in such a way are part of a project which require careful and detailed preparation on the part of several research assistants, students and professors. The lecture is clearly organized and offers good opportunities. The students have got access to the required material from the lesson on Internet as well as the books, and they can concentrate their attention on the lectures. A multimedia review is being prepared on CD ROM, so that in the future the lectures will be organized as asynchronized, independently as far as referring to place and time.

Last year, we organized a asynchronized laboratory session in Osijek. The students were sent 7 exercises by email during the semester, which they solved in Matlab. Students prefer this kind of work because they are not bound by time and space, yet they are at any time in contact with the mentor through Internet. When tested in “laboratory sessions”, the students showed that they have taken this manner of work seriously and that they solved all the exercises on their own. They have shown a better mastery than the previous generations who had been tied to a given time and in a given space following the classical method of laboratory sessions. As many 95% of the students questioned are of the opinion that they this manner of working is suitable for them and that they would rather have laboratory sessions like this in other subjects.

The main problem which arises with all forms of distance education is the so-called “mental condition” [8], that is the way in which to keep the students motivated (in our case for as long as 3 hours). It is the lecturer who, in this case, plays the most important part by delivering very interesting lectures and thus drawing the attention of the students. Secondly, it is also important for the students to be active in the course of the lecture, or being in constant contact with the professor by Internet.

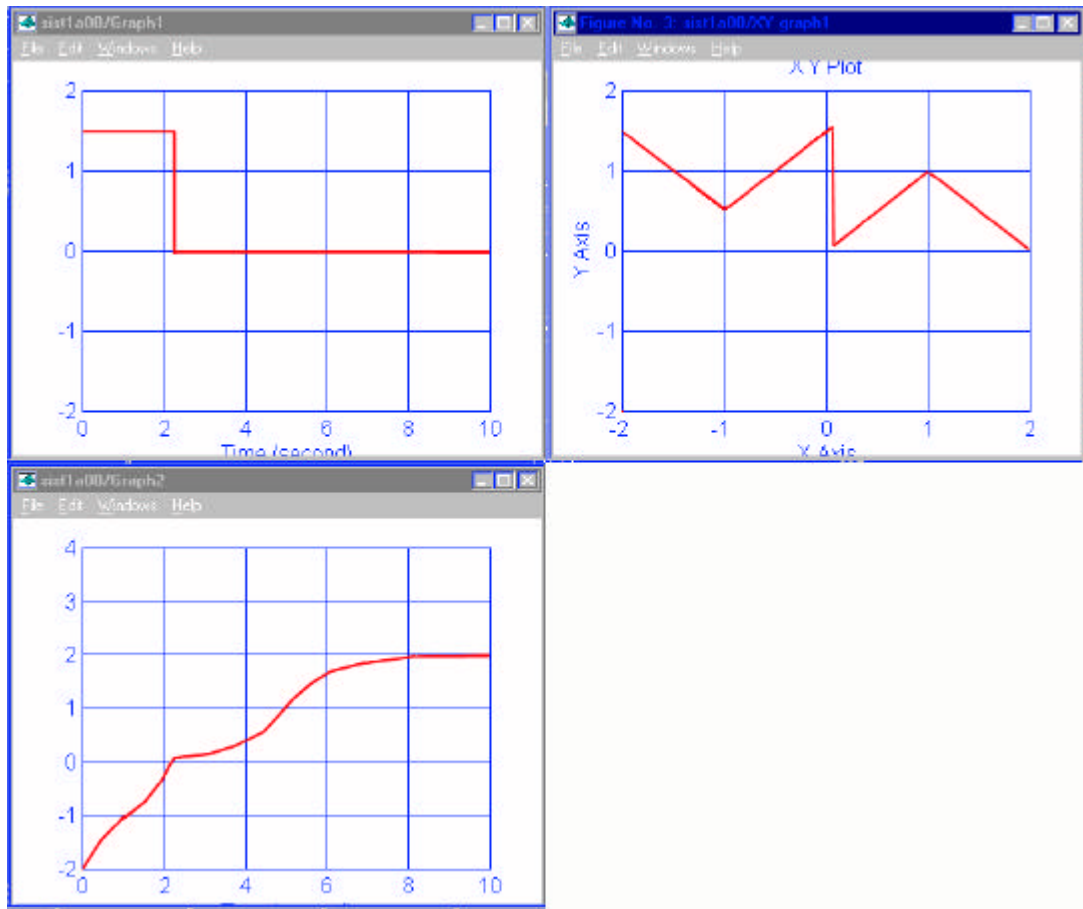


Figure 4. Impulse at the input of the flip-flop, Output of the flip-flop $x = f(t)$ and Trajectory $x' = f(x)$

5. Future expectations

For the time being we are limited to lecturing only in the multimedial classroom as, unfortunately, not all the students in Osijek have computers at home or they are not connected to Internet. As the price of the equipment is dropping, we hope to organize education in the near future in the following way:

Synchronized lectures: the professors holds lectures from his study by means of Internet to students who have a computer at home and they can directly communicate with the former.

Asynchronized where are a multimedial survey of the lecture is on CD ROM and the student can learn whenever he wants while being linked with the professor and the other students by e-mail.

The introduction of new technologies in teaching should facilitate the process of education for both the students and the lecturer. The student should be given the opportunities to study through various methods, a larger flow of information as well as a possibility to study without being tied physically to a given place and time [9]. For the lecturer the introduction of new IT in education means a possibility of using various tools in order to improve the quality of the lectures, the fact that the professor does not have to be physically present at the lectures, a reduced requirement to travel unnecessarily. It is at the same time possible that the student are in contact with the professor in their own given time.

6. Summary

Since erudition is very quickly made obsolete with the rapid development of science and technology, the student should be motivated to learn continuously as well as to follow the trends in the new technology. Distance education plays a very important part in lifelong education. We have all become potential distance learners due Internet and multimedia. This paper showed the first steps which were made in distance learning in Croatia.

7. References

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