

UNIVERSITY LECTURE BROADCAST: A FIRSTHAND EXPERIENCE

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ABSTRACT

In this paper an interactive real-time lecture broadcast system used at Bologna school of engineering is presented which has been in use for the last five years. The systems is effective, easy to use and relatively cheap. The paper discusses the experienced pros and cons and the improvements which were desirable for the service.

KEYWORDS

Lectures broadcast, student interaction, lectures recording.

1. INTRODUCTION

In order to understand the framework within which the system is discussed we must first stress the differences which make the majority of Italian Universities somewhat “peculiar” in the context of the European and world academic institutions and which reflect an organization geared to human more than technical sciences or – you prefer – to a somehow old concept of university. Here are the most significant points:

- Students are free to enroll *in any university school* (in Italy there are no more faculties) provided they have absolved the secondary school courses and passed the related exams (no matter the subjects of the school). Until few years ago (and still in many cases) there was no limit to the number of enrolled student: nowadays they must pass an admission exam which very often has no relation with the subject they are interested in (a *general culture* exam);
- Students can repeat *with no limits* the exams until they pass them and can stay enrolled in the university provided the take part in an exam at least *every eight years* even though they not pass them. Exam sessions can take place freely (normally at least 6-8 times a year) and not at the end of a course or a semester (or a trimester, as it is the case in the school of engineering);
- Students in most Italian universities (in my school too) are almost free of subverting the order of the courses and exams, which means that they can take part in an exam of a course following another which according to the syllabus of the school should precede it, in name of a misinterpreted concept of freedom and awareness (maturity) of the students. While this “freedom” could in some cases partially acceptable (but not advisable) in the “humanistic” faculties (a course of Latin does not depend on a Geography course) is a total nonsense in scientific faculties where the knowledge is “pyramidal” that is each course depends on the previous ones;
- Courses can have unlimited number of participants: there are cases when the number of participants is so high that they cannot be fit into an university class, and a cinema (*yes a cinema !*) was rented;
- There are no restriction in the attendance of courses: anyone (even an occasional visitor) can attend a lecture with no control. Polls about the courses among the students (made during a course) are therefore meaningless given the total statistical uncertainty about the voters;

- The (obviously biased) opinions of the students are the only mean of assessing the quality of a professor and of a course: no independent official verification takes place (although it must be admitted that this is a very difficult task);
- Most exams are only oral, written exams being a rare option, and normally to pass them is a requirement for attending the oral exams (a sort of hurdle);
- The syllabus of each course is freely decided by each professor in name of the liberty of teaching granted by the Italian constitution as a reaction against the fascistic laws which imposed specific and biased subjects. This means that the contents of courses with the same name (i.e. Computer Architecture) are by no means similar in different universities (and sometimes in the same university!) and they are very seldom coordinated with other courses in the same school, normally only on voluntary and personal basis.

2. THE BROADCAST SYSTEM

There is a wealth of papers on lectures recording. In [Rui Y. and others] a system is presented which however focus on automatic tracking and mixing of lectures including subjects, lecturer and audience which although of interest does not fit into our simple (and inexpensive) requirements. The same applies to [Liu Q. and others] and [Bianchi M.]. More geared towards the problems of lectures broadcast are [Zhiqiang Z. and others], [Odorizzi, A. and others] and [Lu C.]. There are also already several free internet courses (i.e. courses <https://www.coursera.org/>, or Apple iTunes university courses <http://www.apple.com/education/itunes-u/>) whose contents are of excellent quality but:

- They are taught in English, a language that not all Italian students (unfortunately) master well enough;
- Some of them are taught with a timetable which is unsuitable to the Italian time zone;
- There are big problems of interactivity and transmission band;
- And finally – the most important issue – they never fit exactly in the study syllabus of each particular university where the subdivision of the knowledge among courses can differ substantially from that offered by these courses. Moreover for advanced courses where the number of subjects can be very large (i.e. Advanced Computer Architectures) the taught topics can be either different or based on a different approaches. (For instance with the last generation of top line microprocessors the accent can be on power consumption, on cache design, on memory design optimization etc., given the obvious fact that not all themes are of the same importance in a particular environment and that not all of them can be tackled in a single course)

This has led us to set our real time broadcast environment and in this context we have selected the system e_lecture from Unreal Streaming Technologies (<http://www.umediaserver.net/electure/index.html>) because of its reduced costs, fairly (not completely easy) installation and management, almost server independency (any PC with any Windows can do it) and all the features which cater for possible paid special courses (i.e. restricted registration and attendance, time constraints etc.). Moreover the interface is web based and students can therefore easily attend the lectures wherever they find themselves. The system directly broadcasts what is displayed on the screen of the professor's PC (allowing maximum flexibility as far as the used programs) together his voice. The number of attendees can be unlimited provided the server bandwidth is large enough. For a good quality remote reception, however, a band of at least 100 Kbit/sec is necessary for the receiver, which makes a typical shared WiFi low-cost infrastructure unsuitable. The system caters also for the record of the broadcasted lectures which can be made available for off-line download. In the website <http://generi.deis.unibo.it> you can find – free for consultation and download – the slides and the recorded lectures of three courses of myself and of my colleague Stefano Mattoccia together with many other documents (in Italian). By experience we have learned that the recording of the person of the lecturer, in addition to wasting bandwidth and recording space, is of no importance for the students of technical courses: what matters is a good view of the projected slides and a good quality of voice recording, which is the case with e-lecture where a good selection of resolutions is available. Interaction is made in real time through questions forwarded to the professor in form a text messages which appear on his console. There are some interesting figures related to the broadcast of the lectures.. In figure 1 we show the average percentage

(calculated over 93 samples) of the registered students attending remotely the lectures against the progression of the course

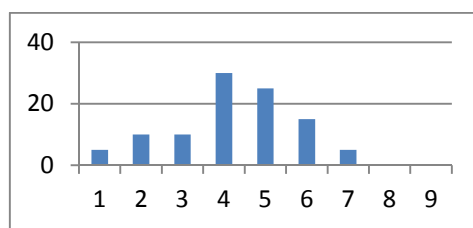


Figure 1, Percentage of remote students vs course progression (percentage)

This figure reflects the general trend of students who attend the course locally: the very small percentage at the right end of the histogram is related to the reduced time interval before the exams: only the small percentage students who want to pass the exam right at the end of the course attend it until its end. The low initial percentage is due on the contrary to the students unawareness of the system. Another interesting histogram is in Figure 2 showing the percentage of remote students asking questions during a lecture against the progress of the course. This percentage is fairly lower than that of the local students: this is very likely due to the difficulty of interaction (to express clearly a question in writing is much more difficult than asking it directly).

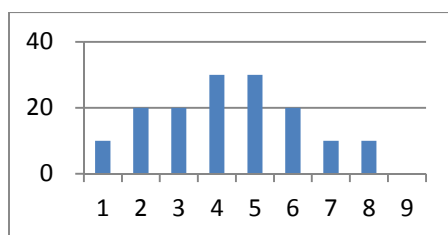


Figure 2, Percentage of remote students asking questions vs course progression (percentage)

3. USAGE CONSIDERATION

The benefits of this system are manifold:

- 1) No camera is required unless the person of the lecturer must be displayed which is an infrequent case (a possible instance is when a lecturer must discuss a complex technical drawing - unfit for the screen because of the resolution - whose photocopy must be distributed to the students in advance);
- 2) It allows students who do not reside in Bologna to follow the lectures with no need for sometimes long transfers or in case of bad weather or transport strikes;
- 3) This in particular applies to students who are temporarily abroad for an Erasmus period;
- 4) It allows students to repeatedly re-listening topics or specific points which they have not in real time understood;
- 5) It compels professor to prepare slides instead of using blackboard and chalk which is nowadays still a common (very bad and ineffective) practice;
- 6) It allows professors to check in detail the contents of the Erasmus courses attended abroad by students, Very often a proposed course can be accepted by a local professor on the ground that a possible local integration will be required if the syllabus lacks some important issues;
- 7) It allows a professor without too many efforts to change and improve year by year his course. This is of utmost importance in the advanced computer architectures where all new improvements must be presented to keep the pace of the evolving "art".

Nevertheless this system does not enjoy large popularity among the colleagues on many preposterous grounds. One objection is that the system de-incentives the local attendance of courses. This is by no means the case: although remote attendance is possible it is fully understandable that a firsthand local attendance is in any case better than the remote one which – for instance – can suffer from network problems and failures. And this is our experience: when possible the students attend the courses locally. Although slides and recordings are available, most students take personal notes of the taught subjects because they are taken according to their sensibility. In other words lecture broadcast is only an important system which cannot however fully substitute the direct lecture. But the use of a broadcasting and recording system has another not confessed drawback for the professors. An old Latin say states that “*verba volant, scripta manent*” (spoken words fly, written word stay) which can be appropriately translated for this case as “unrecorded words *volant*, recorded and broadcasted lectures *manent*” whose meaning does not need any explanation. Notice that the system was widely documented in the local newspapers with *no reaction* from most colleagues. Until the university board does not compel professors to exploit this or similar system, very useful for the students, I suspect its usage will be very restricted. A by-effect of the use of this system in fact is that since lectures are recorded and made available, a specifically appointed board of the university could check the quality of the teaching sampling the subjects chosen by the professor and his teaching capabilities.

4. CONCLUSIONS

Lectures broadcast is an excellent *auxiliary* tool which cannot 100% substitute the direct interaction between professors and students and whose recording is an excellent tool for improving the understanding of the taught subjects, *once the lecture has been attended*. A poll conducted among the students shows that 100% of those who live more than 100KM from the university site (“remote students”) are totally satisfied with the system although they have no way of making vocal questions. Our experience shows that the exam results of student using the system described in this paper is very different whether they have attended the lecture in real time or not. The tools we have been using could be strongly improved if the manager interface were less computer oriented and more user oriented: for the time being, in fact, adding a new lecturer and or new lectures is a not too simple operation which cannot autonomously done by the single authorized professor. Nevertheless its cost effectiveness (the system costs only few hundred dollars and there is also a free version limited to only 5 lecturers) makes it very attractive and the result are definitely encouraging.

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