

INFORMATICS EDUCATION EUROPE

- THE eLECTURE PORTAL: AN ADVANCED ARCHIVE FOR LECTURE RECORDINGS

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ABSTRACT

In this paper we introduce the eLectures portal developed at our university and use it to (a) report best-practices for the archival, organisation, and distribution of recorded lectures (eLectures) as well as for their usage in everyday teaching, and (b) pinpoint open problems and describe current research issues related to the production, management, and usage of such lecture recordings.

Keywords

eLectures, Lecture Recording, Authoring on the Fly, Indexing eLearning Material.

1. INTRODUCTION

In the mid 90s several educational institutions started to record some of their courses. Meanwhile, such lecture recordings or *eLectures* have become an integral part of education at many universities and are being used in addition to traditional ways of teaching at more and more institutions [HMO06]. *eLectures* represent the respective contents with multimedia documents ("virtual lectures"). The recorded media contain the voice, the slides as well as additional handwritings and annotations of the lecturer; all of which are being replayed synchronously. Hereby the interaction of the lecturer with the slides during the presentation (e.g. pointing at objects, underlining, or elaborating on a formula) is also recorded. The replay of these dynamic annotations normally increases the understanding of the contents. Other streams that can be recorded are the video of the lecturer or captured screen recordings of used applications.

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Due to their size (the recorded data can get up to several hundred megabytes) the recordings were originally often distributed to the students using CDROMs. Because of the forth going technological development and the increasing bandwidths, today delivery of such documents over the internet can be seen as the de facto standard. However, we often observe that people spend a lot of thought in how to produce such *eLectures* in the best possible way but lack a good strategy for archival and distribution. Often, the respective files are just offered for download via a course's web page or a web site that was set up separately. However, students generally demand more service, such as better archives and structure, full-text search, etc. Similarly, content providers, i.e. the lecturers, ask for ways to restrict the access to selected groups, integrate the archives into existing learning management systems, etc.

Because of this, we started developing the *eLecture portal*¹ at our institute in 2003. In the following, we first describe the portal and its usage. Then, we illustrate some of its special features and present some issues for current and future research.

2. THE eLECTURE PORTAL

Using the *eLecture portal* students have the ability to access the provided lecture recordings anytime and anywhere if the lecturer authorized access to the materials. The recordings are available in different file formats² in order to ensure optimal delivery to the heterogeneous environment (e.g. different bandwidths, various resolutions on the students' displays, etc.) The *eLectures* are organised hierarchically following the course structure and academic calendar. A user management has been implemented which gives lecturers and the other members of the chair the

¹ <http://electures.informatik.uni-freiburg.de>

² Available formats include Lecturnity with/without video, RealMedia, Windows Media Video, and Flash Animations.

ability to easily upload and organize the recordings after a lecture has been held. An overview of the most important best-practice issues related to the distribution and organization of eLectures can be found in [LMT04].

The eLecture Portal is used more and more by the students. In 2003, there were only 2,700 visits which increased rapidly the following years (2004: 26,192 visits; 2005: 45,990 visits) and with the numbers of visits till June 2006 (26,678 visits) we expect the usage of the portal to increase even further in the near future. In addition, more and more institutes are using the portal. Starting only with a few courses from the Institute of Computer Science in 2003, today almost all of their lectures are available at the portal. Other departments, like the Department of Microsystems Engineering and the Psychology department have also shown interest and started using the portal as well. Detailed access evaluation together with information about how students are actually using the data can be found in [HMO06, ZH02, HLT06].

3. FEATURES AND CURRENT RESEARCH

Because of the increasing interest and growing usage of the portal, we are continuously faced with new challenges in the ongoing development and maintenance of the software. In addition, technology keeps changing and improving, thus continuously providing us with new possibilities and opportunities to improve the related services for both lecturers as well as end users, i.e. the students. In the following, we describe some of the unique features that distinguish our approach from comparable ones. In addition, we address some of the current and future research issues related to eLectures.

Providing a hierarchical structure and a search on Meta data level is important to enable comfortable access to the files. However, because of the tremendous amount of data it is essential to also allow for a detailed search within the actual documents in order to offer a maximum usability and usefulness. For this reason, we developed a search engine which enables the users to perform a full text search in the contents of the slides even when they have been recorded with screen grabbing and therefore are only available in a bitmap format [WEB05]. This is done by matching the screen grabbed recording with the original slides and reconstructing the original object-based textual information. The result of a search is a direct link to the slides containing the search terms. Currently we are developing an extension to this search engine enabling the user to also search in the audio stream, i.e. the recording of the lecturer's voice. For this, automatic speech recognition is used to create a full text index of the respective speech signals.

Further information about the current status of the search engine can be found in [HD06].

With the increasing popularity and performance of mobile devices, new possibilities arise for the delivery and usage of eLectures. As another development, we therefore started to experiment with the distribution of lecture recordings as podcasts. Podcasts are currently enjoying an increasing popularity – especially among students – due to the pervasiveness of mobile media players such as Apple's iPods. Using RSS feeds, the students automatically get the newest lecture recordings when they are made available on the portal. Automatically transferring them to a mobile device opens new perspectives for additional learning scenarios where students can access the respective information "on-the-road" without the need to carry around a heavy and bulky laptop. A description of podcasting and eLectures including an initial discussion of potential usage scenarios can be found in [HW06].

Other past and current research issues related to the archival, delivery, and usage of eLectures include, for example, the integration of students' annotations into the recordings [LL02] and the evaluation of new ways for teaching and learning using eLectures [TL05]. Apart from these questions, there are a lot of other open research problems and interesting perspectives for future work. For example, the demand by other people not directly affiliated to our university to access the lectures, is constantly increasing. This necessitates the development of additional, complex authorisation and permission systems in order to better manage open as well as restricted access to some of the documents.

Another challenge we are facing is the integration of the portal software in the IT-infrastructure of the university, enabling all of our departments to use the provided functionality and to ease the administration and development of the portal by our local software service team.

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