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Lecture Recording and Video-Podcasting with LECTURNITY 2.0

Lecture recording is a novel approach to producing e-learning content in a fast and easy way. The article highlights the importance of lecture recording in academic teaching and learning and introduces a specific tool, i.e. LECTURNITY, used widely in higher education institutions around the globe.

E-Lectures in Higher Education

Information and communication technologies (ICT) are at present an integral part of university curricula. The focus, thereby, is less on distance learning and distance education. It rather seems that ICT in university education complements traditional classroom activities in view of enhancing the overall service quality of academic programs.

It is predicted that the use of ICT in academic teaching and learning will increase rapidly in the coming years[1]. Whereas sophisticated, interactive multimedia learning content will be adopted rather slowly, due to the significant costs associated with such content formats, learning material and learning services directly relating to classroom activities will increase considerably in their importance. This, in particular, holds for so-called e-lectures, i.e. lectures and presentations recorded during the teaching or presentation process and made available as learning resources to students within a short period of time.

A considerable number of higher education institutions already practice lecture recording as a standard form of e-learning in their curricula. The University of Freiburg (Germany), for instance, provides recordings of all lectures held within the standard teaching program of many departments and disciplines. As a result, the entire curriculum in information sciences is already available as e-lectures. An "e-lecture portal" provides easy access to and sophisticated retrieval possibilities within a vast collection of lecture material[2].

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[1] mbb Trendmonitor II / 2006, *Szenarien für die eUniversity 2011. Experten prognostizieren eine deutliche Zunahme von neuen Computer-Lernformen an Hochschulen* (http://www.mmb-institut.de/2004/pages/trendmonitor/Trendmonitor-Downloads/Trendmonitor_II.2006.pdf)

[2] E-lecture Portal University of Freiburg: http://electures.informatik.uni-freiburg.de/catalog/courses.do

Students generally appreciate this service: over two thirds of the students use e-lectures on a regular basis, either exclusively and without following the actual lecture program or as an addition to attending the real lectures for self-study and exam preparation purposes.

Other universities follow along these lines: Lecture recording plays a significant role within the "self-study online"-initiative at Stuttgart University (Germany). Here, the focus is on the low-cost production of study material on the basis of faculty members' regular teaching activities. And the results are positive: 70% of the students confirmed they had used the lecture recordings, 97% of them at their own desk at home and mostly directly via the university websites. On average, the lecture recordings were used between six and ten hours, 20% of the students using a recording instead of the live presentation especially in large events with more than 800 participants. In the case of smaller events, this value is lower (15%), but here it has to be considered that the number of students who weren't able to hear the live presentation because of lack of time and who would have missed the lecture completely without the recording, does play a role. And finally, half of the students (57%) confirmed a gain in motivation from the use of recordings.[3]

Lecture Recording with LECTURNITY

Rapid "Authoring on the Fly"

LECTURNITY[4] is a software tool that is widely used in academic teaching for the recording and distribution of lectures and presentations of all kinds. Creating knowledge modules and learning content with LECTURNITY is based on the idea of capturing all the information used in a presentation in a single recording process and without additional effort on the side of the "content producer". All media at the time of creation, or recording, i.e. audio and video, the presentation slides, handwritten annotations, animations of all kinds, software applications etc., are captured without alterations and integrated in a time-based, multimedia document.

LECTURNITY captures all information at their source and saves them in the form of individual, automatically synchronised media streams. LECTURNITY, thus, goes far beyond a simple video recording!

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[3] See D. Boehringer et. al., *Vorlesungsaufzeichnungen an der Universität Stuttgart*, in: U. Lucke et. al., *Workshop Proceedings DeLFI und GMW05,* Logos Verlag, Berlin, 2005, pp.195-202.
[4] See http://www.im-c.de/lecturnity/en/index.htm

As LECTURNITY produces e-learning content "on the Fly",[5] i.e. during the actual presentation process, lecturers do not need to be proficient in the use of complex authoring systems. They should be able to concentrate completely on their core competencies: the verbal and handwritten communication of their knowledge, using slides or other supporting media.

As LECTURNITY is a presentation recording tool, it always creates a linear, time-based document. The recording document can be used in a variety of ways depending on the specific didactic concept or learning scenario the author has in mind.

Production Process

In a first, preparatory phase, the author prepares the slides in the same way as it is in MS PowerPoint. These are subsequently imported into the LECTURNITY Assistant, which is the actual production, i.e. recording environment. During the import process, LECTURNITY converts the objects on the slides into vector graphics, which is essential for the quality of the recording documents. As vector graphics, the objects are highly scalable, and they are retrievable, i.e. it is possible to run full-text queries over the document to retrieve targeted information contained in the recording document.

Fig. 1: LECTURNITY Assistant

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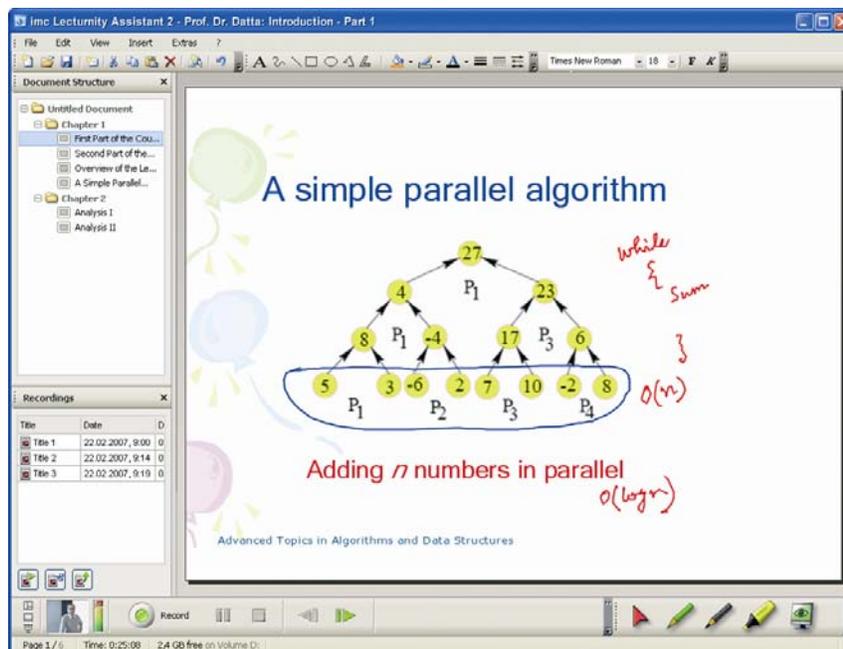
[5] R. Mueller, T. Ottmann, The "Authoring on the Fly" System for Automated Recording and Replay of (Tele)presentations, *Special Issue on "Multimedia Authoring and Presentation Techniques" of ACM*, Springer Multimedia Systems Journal, Vol. 8, No. 3, May 2000.

The actual presentation and the recording of that presentation occur in the LECTURNITY Assistant (**production**). As soon as the slides have been transferred from MS PowerPoint to the Assistant, they are readily available for further processing and recording. The LECTURNITY Assistant emulates the traditional blackboard paradigm in classroom teaching with the teacher using chalk to write down notes on the blackboard during her explanations to the class. Thus, all tools needed for modifying slides, such as pens or markers, are to be found under the slides, exactly where the user would expect them. In the same presentation toolbar, a thumbnail of the current video image and an audio level meter, which visualises the current level of the audio input, gives the author control over the recording without having to pay attention during the presentation. All actions and annotations[6] are saved on the slides during the live presentation. The screengrabbing function enables the recording of other software programmes, animations or simulations directly from your desktop.

Presentations can be modified afterwards (**editing**), they can be reduced to the essentials, sound and video files can be inserted or multiple recordings can be combined to one document. The conversion of a linear, time-based recording document to a structured, page-based learning object with interaction possibilities and tests, takes place in the editor.

Fig. 2: LECTURNITY Editor

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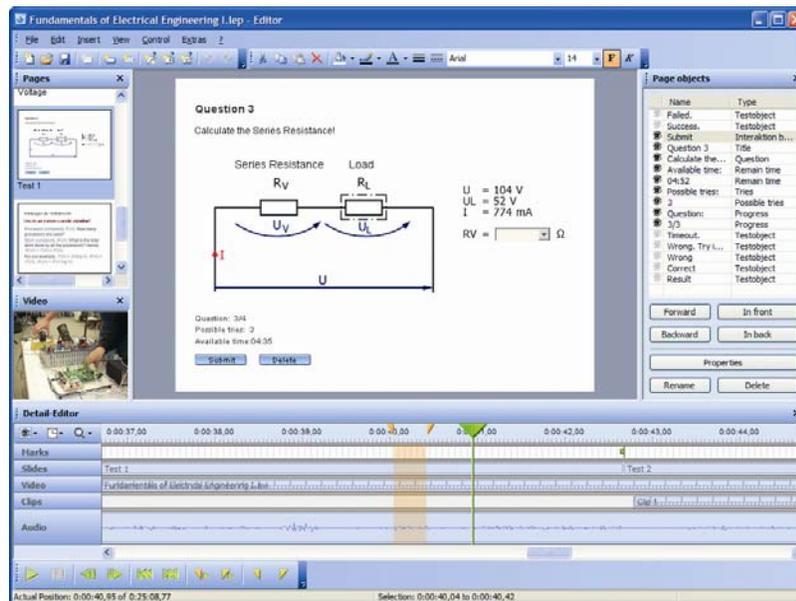
[6] R. Mueller, T. Ottmann: Electronic Note-Taking, in *Handbook on Information Technologies for Education & Training*, H. H. Adelsberger, B. Collis, J. M. Pawlowski (Eds.), Springer-Verlag, Berlin 2002 pp. 121-138.

The processing is carried out using stop and jump labels, branches, as well as buttons and transparent interaction areas that are inserted into the document at the selected positions. This results in various navigation possibilities through the document for the user. In addition, test questions can be created and inserted in the document. Diverse question types are available (drag and drop, multiple choice, true/false or fill-in-the-blank). These are used both to test the knowledge gained and as intermediate tests for the definition of event-driven learning logic within the document. The LECTURNITY Publisher performs all tasks that are important for the publication of learning applications (**publishing**). Here, learning modules are combined to collections for specific target groups. The learning modules can either be burnt to CD with the CD Publisher or converted to different formats. To view the recordings locally, i.e. from a personal workstation, a conversion to a LECTURNITY Presentation Document is recommended. The document can be processed in RealMedia, Windows Media or Flash formats for playback via Internet. The MPEG-4 format is available for using the recordings on mobile devices or as podcasts.

The presentation can be replayed with the LECTURNITY player (**play back and distribution**). Real Player or Windows Media Player replay LECTURNITY recordings as streaming documents. The relevant browser plug-in is necessary for the playback of Flash format.

Results: E-Lectures, Interactive Content, Podcasts

LECTURNITY always creates a time-based, linear recording document. Such a document can be further processed in order to generate the type of learning module needed. LECTURNITY offers three types of content:

- **E-Lectures:** Here, the live character of the lecture is maintained as much as possible and can then be made available to different learning groups for subsequent use;
- **Structured, interactive learning units:** With the LECTURNITY Editor it is possible to convert the linear, time-based recording document into interactive, structured, page-based hypermedia learning objects in the sense of web-based training modules. Here, individual learning paths lead the learner through the learning material. The learner is encouraged to actively participate via questions and exercises.
- **Mobile learning modules (Podcasts)**: LECTURNITY recordings can be podcasted to mobile devices and can then be individually accessed from there for learning and

information purposes. These learning contents are always available – even without internet access.

Fig. 3: LECTURNITY Content formats
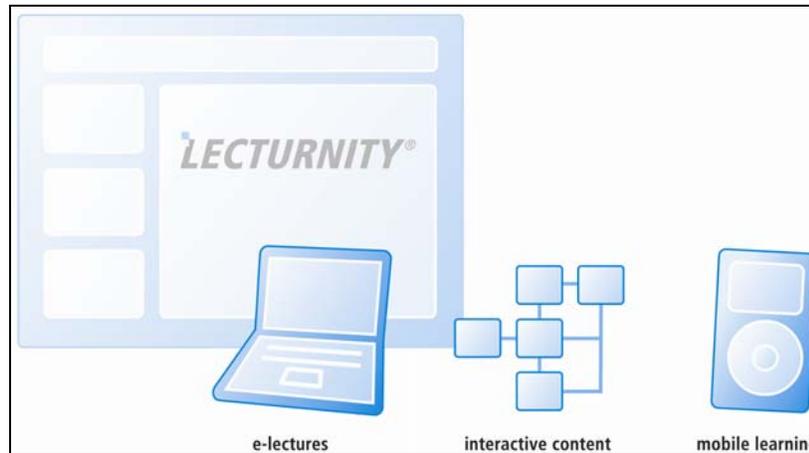
Technical and Usability Aspects

LECTURNITY is a very successful tool for rapid and cost-effective content production. Not only are recordings popular amongst students; the tool is also very much appreciated by its authors.

LECTURNITY meets the following requirements for an "on the Fly" authoring system:

Simplicity

The complete content creation process is fully automatic. Content creation must be possible without technical programming expertise, a production team or assistance.

Usability

The user-interface of the system is designed in such a way that every user can use the system within a few minutes. For this purpose, current interaction schemata and Human Interface Device Standards are followed. The creation of the knowledge modules is based on the presentation principle; LECTURNITY almost exactly adapts to the nearly universal standard among the presentation systems, MS PowerPoint. The users can operate the system as if they were holding a presentation with MS PowerPoint. The design of the user-interface enables the users to operate the system in a few minutes without training or manuals.

Quality

Quality results from the source material used during the actual presentation, i.e. the slides, texts and images used, the actual form of the presentation and, last but not least, the impressions generated during the actual presentation. This quality is maintained during the recording process; lossy codices, poor synchronisation of the individual media or the omission of media do not impinge on the quality of the final result, i.e. the presentation recording document .

Flexibility

LECTURNITY recordings can be exported in the current standard formats – RealMedia, Windows Media, Flash and MPEG-4. The provision of recordings in other forms is also supported – from local or net-based through to CD/DVD based access to the recordings. The recordings themselves support the SCORM standard for the sharing of content objects. The recordings can therefore be used across all platforms; their integration in any Content Management System, web-based lecturing/learning environment or learning platform is guaranteed.

Retrieval

As content production with LECTURNITY is quite efficient, authors generally produce a large number of recordings. If (except for the metadata instrumentation) no other form of retrieval is supported, for example, in accordance with SCORM, the steadily increasing amount of content will soon become difficult to operate and will as a result have limited use. LECTURNITY, therefore, supports text-based retrieval in terms of a full text search at knowledge module level and recording independent at recording collection level. The tool also support retrieval activities (skimming, browsing) in a visual and an acoustic form along the timeline of the recording document.

Open, Complete Intermediate Format

LECTURNITY is based on the open document format SRM-Media (Synchronizable, Randomly accessible, including a Master), with which numerous, time-based knowledge modules can be recorded. SRM-Media acts as a container. The media streams contained therein (video, audio, animations, etc.) are not restricted either in number or media type as long as they are synchronizable, support real-time random access, and one of the streams is a

master stream. A master stream is an audio stream that covers the complete period of the knowledge module, in other words it begins at the start of the module and finishes only when the module has been completely played. With the help of this master stream, LECTURNITY achieves a so-called master-slave synchronisation. That means that other streams are oriented to the master stream during the playback. The master stream generally contains the voice of the author which is, from experience, the most important element in the document as far as the user's understanding is concerned.

Generic Application Model

The LECTURNITY application model adapts dynamically to the structure of the document. It includes a plug-in for every stream of the document suited to the media type of the stream. In other words, there is a video plug-in for video stream, an animation plug-in for an animation. If there are two video streams, two instances of the video plug-in will be created. The master stream plug-in has an excellent position. All plug-ins are independently processes and as such are loosely connected via communication channels with the master stream plug-in.

The application model is generic, while new plug-ins for new media can be integrated at any time without the need for changes to the implementation of the model or to existing documents.

From e-Lectures to Content Sharing: SLIDESTAR[7]

With the increasing distribution of e-lectures, a demand is arising for the fast and convenient provision of these content modules to the respective target groups. Slidestar is a new Web 2.0 Community platform with which universities can offer their students such a service. In addition to the rapid searching for and retrieval of relevant learning content via a full text key word search, Slidestar also makes the sharing, the handling and the assessment of content very easy and simple.

With Slidestar, authors can easily place their recorded courses on the web, supplement them with scripts or slides and make them available for downloading. The upload of content is very simple thanks to the integrated indexing and tagging procedures. Slidestar, in particular, draws on the ability of LECTURNITY to automatically index the content on the presentation slides.

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[7] http://www.slidestar.net

In Slidestar, the possibilities of automatic tagging via full text indexing are used. In addition, it is possible to jump from the returned search result directly to the relevant position in the content. Time-consuming browsing through the content can be avoided. The powerful search engine that covers both presentation slides and even the audio stream of an e-lecture is best demonstrated on the Freiburg e-lecture portal which is the first full-fledged implementation of the Slidestar search and retrieval technology

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Dr. Tilman Kuechler holds a Ph.D. from the University of Washington, Seattle. As Director Higher Education, he is responsible for the IMC's business development activities in the higher education sector. In this position, he co-designed a number of IT implementation and integration projects based on the learning management system CLIX. Prior to his position at IMC, Dr. Kuechler served as project manager to the German Science Council and the Center for Higher Education Development (CHE), directing projects on policy issues relating, in particular, to the transformation of the higher education system in the information age.