LECTURERS' REACTIONS TO AUTOMATED LECTURE CAPTURE INTRODUCTION

STAVOVI PREDAVAČA PREMA UVOĐENJU AUTOMATSKOG SNIMANJA PREDAVANJA

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Sažetak

Snimke predavanja postaju sve popularnije u visokoškolskom obrazovanju i očekuje se da će postati standard za većinu predavanja u budućnosti. Međutim, još uvijek postoje brojne prepreke, uglavnom vezane uz financijske, ljudske i tehničke probleme, koje utječu na brzinu procesa usvajanja tehnologija za snimanje predavanja i kvalitetu dobivenih snimki. Ovaj članak opisuje pilot projekt vezan uz uvođenje automatskog snimanja predavanja na Sveučilištu u Zagrebu u akademskoj godini 2015./2016. Sustav za automatizirano snimanje i objavu predavanja je dizajniran, implementiran, testiran i konačno podešen za rad u jednoj od predavaonica. Ostvareni sustav ne zahtijeva apsolutno nikakvu intervenciju predavača kako bi predavanja bila snimljena. Kao rezultat uvođenja ovog sustava snimljeno je više od 100 predavanja u izvedbi 11 predavača na 13 kolegija. Među predavačima je na kraju semestra provedeno istraživanje vezano uz njihove stavove prema snimanju predavanja, njihova očekivanja, strahove i iskustva. Rezultati istraživanja mogu se koristiti kao smjernice za izradu i implementaciju sličnih sustava u budućnosti.

Ključne riječi: snimke predavanja, automatsko snimanje predavanja, stavovi predavača

Abstract

Lecture captures or video recordings of lectures are becoming increasingly popular in higher education and can be expected to become a standard for majority of lectures in the future. However, there are still a number of obstacles mostly related to financial, human, and technical issues, that are influencing the pace of the adoption process and the quality of resulting lecture captures. This article describes an automated lecture capture pilot project implemented at the University of Zagreb in the academic year of 2015/2016. The Automated Lecture Capture and Publication System has been designed, implemented, tested and installed in one of the lecture halls. The implemented system requires absolutely no intervention from the lecturer to capture a lecture. As the result, more than 100 lectures, delivered by 11 lecturers in 13 courses have been captured. An on-line survey has been conducted among the lecturers at the end of the semester investigating their attitudes towards lecture captures, as well as their expectations, fears and experiences. The results of the survey can be used for designing and deploying similar systems in the future.

Keywords: lecture capture, automated lecture capture, lecture recording, lecturers' attitudes

1. Introduction

1. *Uvod*

Ex-cathedra lecturing is today one of the most represented, if not the most represented way of knowledge transmission in higher education. Although it is well known that live lectures suffer from a number of inherent disadvantages that hinder their learning potential [1], it seems that there are still certain properties of live lectures that make them appealing to students even when there is a wide range of other learning materials available [2]. Lecture capturing is a method through which live lectures can be turned into an everlasting learning material. While live lectures are usually a one-time events, their captures can

help students to make up for a missed lecture, but that can also be supplemented and synchronized with additional materials, thereby compensating for live lectures' intrinsic deficiencies [3]. A vast body of research by far has suggested that the learning potential of live lectures is mostly similar to the learning potential of lecture captures [4].

The facts that lecture captures are based on lecturing, which is a commonly used method of knowledge transmission, and that they can help students in knowledge acquisition, are today not the only reasons why lectures can and should be captured in higher education. Lecture captures also provide an insight into a university's teaching practices (for example using audience response systems) and lecturers' skills (for example interacting with the audience during a lecture and guiding the lecture in accordance with the audience reactions). This can be used to attract future students and thereby be beneficial for the university. And finally, universities can also use lecture captures for their remote or online programs, which are today more and more common, and charge for their usage.

These potential uses of lecture captures are not a novelty. University of Geneva in Switzerland, for example, has been engaged in lecture capturing practices since the 1970s [5]. But recent technological advances have played a significant role in increasing the popularity of lecture captures. Lecture capturing equipment, including video cameras, microphones, frame grabbers, is getting ever cheaper and more available, the disk space price for storing the captures is lower than ever, and there are a number of free software tools for capture support available. It is not surprising therefore, that lecture captures are today abundant online and can be found on universities' YouTube channels, websites, or available in context of massive open online courses.

However, there are still some issues related to lecture capture adoption in higher education institutions. These issues are mostly related to technical competences, manual work needed to capture a lecture, and lecturers' anxiety towards the capturing process. In this paper, some experiences regarding those issues are described through the description of the implementation of a fully automated lecture capturing system,

and through the opinions and experiences of the lecturers whose lectures have been captured in the pilot phase of the project. The rest of this paper is organized as follows: section two contains the description of reasons that led to the decision to implement a new software solution for lecture capture and publishing automation and the properties of that implementation. In section three the outcomes of the project and lecturers' opinions and experiences with automated lecture capturing and publishing obtained through an anonymous survey are presented. Final conclusions of the project are presented in section four.

2. Automated Lecture Capture and Publication System

2. *Sustav za automatsko snimanje i objavu predavanja*

The main functions of systems supporting lecture capturing and publishing are capturing one or several video sources (video of the lecturer and/or video of his slideshow/computer desktop/smartboard) and one or several audio sources (desktop and/or wireless microphone), post-processing of the capture files (re-encoding to target quality and codec, multiplexing video and audio, and optimizing video for web delivery), and finally publishing processed capture files on a server. Although there are readily available free tools like Opencast/Matterhorn [6] or Glalicaster [7] to support these processes, multiple issues in the attempts to set them up have forced us to consider developing our own implementation. These issues were a result of complex interactions between the operating system, capture hardware properties and drivers, and imperfections of the tools themselves. The requirements on the target system to be developed were:

- to be compatible with Linux based OS
- to be as simple as possible, but supporting a fully automated lecture capture and publishing process based on an lecture schedule available online
- to impose no limitations on the number of audio and video sources that can be captured (depending only on the processing power of the capture computer)

- to support simultaneous capturing and automated livestream of all capture sources.

The target system was finally implemented as a set of three main software applications, written as BASH scripts:

- The scheduler script, which runs upon every computer boot or when capture ends and, in case the next capture should begin within the next three hours, schedules the next capture using standard Linux *at* command. The lecture schedule is downloaded from the university website. If there is no capture to perform within the next three hours, the script sets auto turn-on and shuts the computer down for that time using the *rtcwake* command.
- The capture script, invoked by the at command, performs the entire capture process. It uses *FFmpeg* software (http://www.ffmpeg.org) to capture any combination of any number of audio and video sources. Each *FFmpeg* process stores its encoded output in a file, but also duplicates the output to a predefined localhost port, from where a *VLC media player* instance (http://www.videolan.org) will broadcast it to a livestream with or without re-encoding.
- The post-process script is invoked every day at 19 o'clock or after the last scheduled lecture in the evening, and performs media re-encoding to target quality and finally transfers the media files to the streaming server where they are available for on-demand consumption.

Although the described system is minimalistic, it fully supports the tasks it should support. Besides standard Linux commands, it requires only two external applications (FFmpeg and VLC), both of which are open source applications available in repositories of most Linux distributions.

The system was initially deployed in one of the department's lecturing rooms at the beginning of the winter semester of the academic year of 2015/2016. Following the deployment, lecturers have been informed at the department meeting that capturing is taking place. Printed notifications have been placed on the walls in the lecturing room where the system was installed. It was agreed that captured lectures would be available only to lecturers who held them and would definitely not be published without their full agreement.

3. Lecturers' opinions and experiences with automated lecture capturing

3. *Stavovi i iskustva predavača vezani uz automatsko snimanje predavanja*

By the end of the semester more than 100 lectures, delivered by 11 lecturers in 13 courses have been captured. Lecturers were then asked to participate in an anonymous survey about their attitudes, opinions and experiences with lecture capture in general, and the specific automated lecture capturing implementation at the department. The survey consisted of about 15 items (some questions were displayed depending on the answer on a previous question) and was completed by 9 of 11 lecturers.

The first group of survey items consisted of several questions about lecturers' own prior experience with lecture captures. Five out of nine lecturers (55.5%) claimed never before to have wanted to capture their own lectures with reported reasons being lack of personal benefit from capturing lectures or lack of their usefulness for students. Three lecturers (33.3%) reported to have already captured their lectures to provide students with an additional learning material, while one lecturer reported not having captured his lectures because of lack of technical support. When asked if they have ever consumed lecture captures, seven out of nine lectures answered affirmatively, with main reasons for that being acquiring some new knowledge (85.7%), and gaining insight into other lecturers' teaching practices (57.1%). The two lecturers who never consumed lecture captures explained that they prefer other types of learning materials. The same two lecturers reported never to have wanted to capture their own lectures, which could be explained by projecting their own preferences on the students.

In the second part of the survey, all of the lecturers reported having been aware that their lectures were being captured over the last semester, as well that they haven't introduced any kind of change in their lectures because of that. Four lecturers, however, noted that they would have changed their lectures if they were planning to later publish their lectures. None of the lecturers had reported any issues with the technical implementation of the system, which

was not surprising, as there is absolutely no need for any intervention of the lecturer before, during, nor after the capture has taken place. The only missing feature one of the lecturers has reported was video editing in the post-processing phase.

In the third part of the survey, lecturers were asked about their general opinions for or against publishing their lectures. Three out of nine lecturers reported having nothing against publishing their lectures online in order to help students. Three other lecturers reported that they would agree to publish their lectures if certain conditions would be met. The conditions reported were that the recordings would be available to students only, that they would receive a financial or other kind of compensation, or that they could choose which lectures to publish and which not. Three lecturers who reported they would not agree to any kind of publishing of their lectures reported their reasons are that someone else could be using their knowledge or recordings to earn money, that lectures are about personal contact between the lecturer and his students, or because of their environment at the university.

In the fourth, final part of the survey, lecturers were asked if they requested access to their lecture captures, which six out of the nine of them didn't. Only one of the three lecturers who did request access to their lecture captures reported to have watched them. Three of nine lecturers reported that they would be more prone to capturing their own lectures now than before the automated lecture capturing was introduced. Only one of those three lecturers reported not having captured any of his lectures before.

4. Discussion and conclusions

4. *Rasprava i zaključci*

Although the sample size for this survey was very small (nine out of eleven lecturers completed the survey), it is the opinion of the authors that the described results provide valuable insights and are still worth reporting. The participants' opinions can be used as a starting point for identifying obstacles to automatic lecture capturing introduction on a higher education institution and their potential solutions.

The first interesting point supported by the obtained data is that it seems that a majority of lecturers is familiar with lecture captures and that lecturers use them for knowledge acquisition and gaining insight into other lecturers' teaching practice. On the other hand, it also seems that a lecturer's personal opinion on the usefulness of lecture captures for learning could correlate well with his readiness to provide students with his lecture captures, even if there is absolutely no work on the lecturer's side required in the capturing or publishing process. The only two lecturers who reported never to have consumed lecture captures, also reported not wanting to publish their lecture captures under any conditions, as well as that they personally prefer other kinds of learning materials.

The second point supported by the obtained data is not surprising at all. It seems that introducing a financial compensation or maybe another way of recognizing lecturers work could motivate lecturers to make their lectures available at least to their students. The fear of someone else making a profit by using someone else's captured lectures, or an explicit expectation of some kind of compensation for that was mentioned by two survey participants.

Finally, it seems that even though the support for lecture capturing was fully automated and required no intervention by a lecturer at any time, it still seems that the interest of lecturers for their captures was and remained low, at least based on how many lecturers requested access to their captures. Still, as lecture captures are mainly intended for students, which most lecturers are aware of, this is not necessarily an alarming result. If some of the lectures would be published, it remains to be seen how well they would be accepted by students.

It seems overall, that many lecturers don't consider lecture captures as a valuable learning resource, although the research has shown that students do consider having lecture captures available to be helpful for their learning [8], [9]. Raising lecturer's awareness about this, as well as raising their awareness about the different purposes lecture captures can be used for could perhaps influence their opinions. With automated capturing process and the identified benefits, it would be a pity if the lecture captures' potential would remain unutilized.

5. References

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Predrag Pale je doktorirao na Fakultetu elektrotehnike i računarstva Sveučilišta u Zagrebu gdje poučava i istražuje u području primjena IKT u obrazovanju. Znanstveni mu je interes u primjeni videa i snimki predavanja u učenju, interakciji učitelja i učenika te računalno potpomognutoj samoprovjeri znanja i vještina. Idejni je začetnik, arhitekt i koautor portala o teorijama učenja, alata za prikaz obogaćenih snimki predavanja LeCTo, alata za interakciju na predavanjima AuResS, sustava za automatsko snimanje i objavu predavanja ASOP, sustava za automatsko pretraživanje weba i vizualizaciju rezultata WeSerV i drugih.

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