Improving E-Learning Videos Using Personalization and Social Signals

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Abstract: Videos can be more engaging and relevant to a course than a textbook, but their linear format frustrates many students. Content based topic detection and tracking algorithms are unlikely to be able to exploit the variety of presentation methods in video lectures; therefore we propose to develop a tool to make videos more navigable and more effective for information retrieval and teaching by tracking and exploiting behavior patterns of students who watch the video. Students will be able to personalize the content by highlighting the video, adding comments, and hiding portions of the video in order to skim the video more effectively. This will allow instructors to segment students based on their habits and preferred mode of learning and adapt the course material accordingly. In this paper we present our early results of indexing video lectures into chapters and developing a discussion board based on each chapter.

Introduction

An e-learning pain-point for students is their inability to personalize digital materials. During the pre-digital era, students regularly dog-eared pages, highlighted or underlined text, and made margin notes in their textbooks so that it would be easier to return to the material later, or so that material would stand out in a second reading. A shared textbook would carry with it a history of valuable student annotations; indicating which parts another student in the same course thought were important. Instructors want to provide personalized education so that all students reap the most benefit from a course, and so that student retention can be kept as high as possible.

In this research we are prototyping a learning social network around video lectures. The goal is to take any lecture video and add chapters (cue points) on a timeline for that video. The students watching the video should be able to navigate the chapters easily and post comments or questions on any given chapter that the instructors can then easily answer and promote a healthy discussion online. We are trying to measure if student participation and engagement increases when they have such a mechanism when compared to using a native discussion board in a general Learning Management System (LMS).

Literature Review

Cooperative learning has been shown to improve student achievement by up to 28% (Kagen, 2009). One such cooperative strategy that teachers could employ in their classrooms is having student-led conversations. These types of conversations help students to construct knowledge and develop a deeper understanding of the content (Valentine, 2007).

The review of literature in this field suggests that agents can serve numerous instructional roles such as tutor, personal assistant, buddy, and counselor and can also serve many functions (Fernely, 2006). Pedagogical agent could enable "increased motivation (Moreno, 2001) increased smoothness of information and communication processes, increased critical thinking and develop problem solving skills (Gulz, 2004). Social interactions and communication to pedagogical agent appear to be positively related to student satisfaction (Aragon, 2003), enjoyment (Berge, 2005) and social immersion (Morton, 2005). (Doering, 2008) found that learners engaged in multifaceted social dialogue with the agent provided significant increase in learning. According to (Kim, 2006) a learner can learn content through interacting with pedagogical agent, who may provide information or encouragement, or collaborate with the learner. Using online videos to increase student engagement and enhance content is a growing trend in education.

We believe that personalization and sharing among online social circles will facilitate learning at a faster pace, and the aim of this research is to test this idea. Our method includes development of a new video timeline tool that allows students and instructors to share video viewing data and annotations - a tool which we expect to be useful to a broad audience. We expect students will take significantly less time to search for information in videos with our timeline, and that within a constrained amount of time students will find more facts in a video rush when using our timeline than without it. We expect students who use the video will spend less time watching the video and yet will perform similarly on post-assessments, and we expect a survey to show that students will prefer using videos with the timeline.

Design Method

This project makes use of Kaltura (Kaltura Whitepaper,2012) API to divide any video into chapters and navigate among those chapters easily. Kaltura is an open source online video platform providing both enterprise level commercial software and services, fully supported and maintained by Kaltura, as well as free open-source community supported solutions, for video publishing, management, syndication and monetization. To use Kaltura API we need to have a Kaltura account.
When developing applications that interact with the Kaltura API, it is best to use a native Client Library. You can download the Client Library for the programming language of your choice. We have used the PHP5 Client Library.

Background

Over the last few years, social media has radically changed the way we communicate. Adopting social tools and video applications for the workplace not only meets the expectations of today's employees, partners and customers, it ignites tremendous change for your business – increasing productivity, engaging customers and saving costs. A term coined by Salesforce.com CEO Mark Benioff, the "Social Enterprise" has become an increasingly hot topic. Jive, Yammer, and existing incumbents such as Microsoft, IBM and Salesforce.com(Kaltura Whitepaper,2012) are delivering "social enterprise" or social business applications that enable employees, vendors, and partners to work and communicate more efficiently across time zones, languages and geographies. The primary goal of these initiatives is workplace productivity and customer engagement. Driven by technology consumer trends, social enterprise and social collaboration applications borrow much from consumer social media. They are often described as "Facebook for the enterprise". These social collaboration systems allow the professional to stay up to date on people, groups, and news via a real-time feed. They also enable sharing, commenting and consumption of all types of media, and centralize multimodal communication, text, audio and video through one web interface across multiple devices. The value proposition is vast: fast, asynchronous knowledge exchange through a many to many communication channel, resulting in speedier product lifecycles, competitive advantage, educated employees and constant dialogue across the enterprise and its global offices and customer base. In today's enterprise, video extends far beyond marketing. It opens up new interactive communication channels, driving collaboration and taking productivity in the workplace to a new high. Here are just a few examples:

- Improve communications from leadership
- Create effective and cost efficient training programs
- Encourage knowledge and best practice sharing across the enterprise

In a recent Forrester study, 25% of IT Decision Makers (Forrsights Networks and Telecommunications Survey, Q1 2011) said they were already adopting Enterprise IP/digital video solutions for internal use while 20% stated they were planning to do so. Kaltura has seen an increasing demand for the use of video as part of the organization's overall social media strategy. This means adding video to all the communications channels and applications in place. The demand for video to power social business and learning/training applications has radically increased vs. video usage for marketing purposes alone. Kaltura's open source platform includes hundreds of REST-based application programming interfaces (APIs) providing programmable access to every core service of the platform. With full access to the API, you can independently extend every feature and functionality of the Kaltura Platform. This means you'll be able to seamlessly integrate Kaltura's various

solutions, services, and widgets to create a unified experience within your chosen environments - be it a known CMS, or custom in-house application.
End-to-end media asset management flows. Kaltura's API can:

- Ingest content, setup watch folders and storage profiles
- Create and manage metadata profiles, flows, thumbnails, and custom distribution adapters
- Setup Access Control Profiles; control who can access your content and when
- Tap into the media asset lifecycle and get client and server notifications for every step of the ingestion, transcoding and publishing workflow
- Capture video analytics and measure your content performance
- Integrate 3rd party solutions and applications with Kaltura, and extend your reach on the Kaltura Exchange

Table 1 below shows how the Kaltura API is used in the creation of a web application.

Step	Name	Description
1	Include Client Library	Explicitly include the client library in your application OR
		Your environment automatically includes the client library in your application using a feature such as the PHP auto-loading capability.
2	Instantiating a Client Object	Create a Configuration Object
		Start a Kaltura Session
		Set the Session for the Configuration Object

Table 1: Steps to use the Kaltura API for a web application

Tools and Process

We have used PHP, JavaScript and MySQL along with AJAX to implement a forum for the web page. The forum includes the ability to see comments divided into the chapters that they were posted in, ability to post a comment or reply to one or display them without refreshing the page and also provides a way for any user to subscribe to a particular comment so that he/she can receive emails whenever someone posts a reply to that comment. The mails are sent via PHP mailer and they are sent to the email id via which the user had logged in. All of this happens in the background without any user interaction. Table 2 below describes the complete workflow of creating a test application used for this research.

Step	Name	Description
1	Authentication	For authentication we used OpenID to provide Google authentication. Users simply login via their google account. The first time they login google asks for permissions to access some of the user's data. Once their data is stored they are redirected to the web page with the video.
2	Creating Chapters	Dividing a video into chapters is achieved using cue points, part of Kaltura's time based data features. In our project we divided the video into eight different chapters. You can use Cue Points Service API and add Code Cue Points for every chapter in the video.
3	Creating Different Landing Pages	Creating different landing pages for every chapter might seem cumbersome to implement and maintain, however, using a few Apache mod_rewrite tweaks, this can be easily achieved. In our project we used an .htaccess file on the example folder that redirects all chapter links to the same PHP landing page. You can also use the .htaccess file instead of adding it to your main httpd.conf file, be sure your virtual folder "allowOverride" attribute is set to "Indexes FileInfo" to allow the .htaccess to override the default Apache settings.

| 4 | Creating the Comments Section | We used PHP, HTML, Javascript and AJAX to add a discussion board around the video. Its features include being able to start new threads, a reply option ,a subscribe option which allows people who have chosen to subscribe to a particular thread to receive emails whenever someone comments on their code and most importantly being able to comment and reply without refreshing the video. It also shows the time, date and name of the person who posted it. The comments section changes based on the chapter that the video is currently in. For instance if the video is currently playing chapter 2 only the threads for that chapter show up. It changes automatically when the chapter changes. This is done using cuepoints API of Kaltura. |

Table 2: Workflow of a test application

Findings

We first tested the site with a rudimentary comments section which had some quirks .After making improvements to the comments section we tested it again. The data was collected over a summer 2013 offering of an introduction to programming course. There were 22 students enrolled in the course and the below two tables show the comparative results. The students were made to alternate between our method of interaction vs. the traditional discussion board via the Blackboard LMS. The four assignments chosen for the comparison were similar in complexity and effort needed to solve. It can be clearly seen from the Tables 3 and 4 that more students engaged and participated using our method than the traditional discussion board. It indirectly helped in lessening both office visits and emails from the students.

Iteration	Threads	Replies	Unique Users	Comments	Instructor Comments	Office Visits	Emails to Instructor/TA
1	3	4	7	24	4	2	1
2	2	2	5	16	5	1	0

Table 1: Data collected via Kaltura based web application

Iteration	Threads	Replies	Unique Users	Comments	Instructor Comments	Office Visits	Emails to Instructor/TA
1	1	1	2	4	2	4	5
2	0	0	0	0	0	5	3

Table *2*: Data collected via traditional discussion board

Future Work and Conclusions

In the future we will measure the effectiveness of the proposed tool for student learning in several ways,(1) By measuring the amount of time it takes for students to identify prescribed facts from a video rush (without captions or a transcript) with and without the new timeline; (2) By providing a list of questions and seeing how many can be answered within a prescribed amount of time using video rushes with and without the timeline;(3) By comparing viewing patterns for students who have access to peer viewing data to those who are watching a video without access to peer data;(4) By comparing post-video assessments of students who had peer data and those who did not; and (5) By collecting survey data.

We expect students will take significantly less time to search for information in videos with our timeline, and that within a constrained amount of time students will find more facts in a video rush when using our timeline than without it. We expect students who use the video will spend less time watching the video and

yet will perform similarly on post-assessments, and we expect a survey to show that students will prefer using videos with the timeline.

In this brief paper we have shown some early results of our approach to improve student participation and engagement via e-learning videos. It is evident that much more testing and data collection is needed to further validate our claims and we plan to finish this during the Fall 2013 and Spring 2014 semesters. Testing also would be performed in various sections of the course as well as other courses that use e-learning videos to eliminate any noise or domain bias.

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