Community Rating in the Tele-Lecturing Context

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Abstract— **As the problem of easily and quickly generating tele-lecturing content has been solved and many tele-lecturing projects have been set up, new issues arise. The search amongst the video content is a major problem. It takes a long time for users to filter through all the videos available until they find the learning content they are looking for. This paper describes a concept for the set-up of a rating functionality as the first community feature to enhance search functionalities in tele-teaching portals. The utility of a rating feature is explained from the user perspective. Furthermore practical issues of applying a rating functionality for tele-teaching scenarios are illustrated. A method for calculating a mean rating across several layers of connected content items is suggested as well. Other fields of application for the newly generated rating data are proposed.**

Keywords: e-Lectures, Rating, Tele-Teaching, Community, User-generated content

1 Introduction

In our knowledge-based society today there are two main issues concerning the people when looking for knowledge: how to filter all the information available to find the required information and how to properly learn. One of the main constraints for learners is the time. Therefore tele-teaching was introduced were people can learn independent from time and place according to their interests and learning speed. In order to support more precise search and content filtering options for learners and therewith improve the quality and speed of their learning, rating can be applied to the tele-lecturing context. This paper motivates the usage of rating for e-lectures and explains technical and learning-related issues that need to be considered. As sample the rating functionality was implemented at the tele-teaching portal tele-TASK[1] of the Hasso-Plattner-Institut (HPI). As the tele-TASK project includes a recording system as well as a portal for distributing e-lectures, some details of the project will be explained in the next paragraph.

1.1 Tele-Teaching with tele-TASK

The tele-Teaching Anywhere Solution Kit [14], short tele-TASK, is an e-learning project at the chair Internet-Technologies and -Systems at the HPI. The tele-TASK project was started in 2002 at the university of Trier by developing a hardware system for lecture recording. The goal of the project is the recording and distribution of lectures, seminars, reports and other presentations with as little as possible effort of material and resources. Therefore an all-in-one solution was developed including hard- and software for lecture recording. Two video steams (a video of the lecturer and screen capturing of his laptop or a smart-board) and one audio stream can be recorded at once. More than 2000 lectures and 4000 podcasts of the tele-TASK archive can be accessed free of charge via web-browser or portable device. The large video archive and the web-platform tele-TASK are the basis for further research and development at the HPI.

2 Rating in Tele-Lecturing Portals

Rating is "a classification according to order or grade" [1]. In the context of the rating of media items, rating is the quantification of the personally perceived quality of an item. It belongs to community functionalities which originate from web 2.0 platforms. This section will first introduce community and social web functionalities. If the two fields, tele-lecturing and community functionalities, shall be combined there are two ways to do so. First one might integrate e-lectures into existing communities or second integrate social network functionalities into an existing tele-teaching portal. The pros and cons of both are discussed in the next paragraph. Finally the utility of rating in tele-teaching portals will be discussed.

2.1 Community and Social Web Functionalities in Tele-Lecturing Scenarios

Since the beginning of the web 2.0 [11] era numerous social web portals whose main motivation is fostered around the user participation have evolved and grew very quickly. Some of the most popular online social networks are Facebook[2], MySpace[3] and Twitter[4] in the private context as well as LinkedIn[5] and XING[6] for the business world. Other websites popular for their social web features are

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[1] http://www.tele-task.de

[2] http://www.facebook.com/

[3] http://www.myspace.com/

[4] http://twitter.com/

[5] http://www.linkedin.com/

[6] http://www.xing.com/

Wikipedia[7], MySpace[8], YouTube[9] and Flickr[10]. A number of social web and community features have been found to be useful to the users. These include blogging, the collaborate creation of wikis, social annotation and tagging, evaluating (eg. rating and commenting), recommending, content sharing and linking of content items [11, 8]. That community functionalities are not only useful for networking, but also for learning contexts was found out at the beginning of the e-learning era around 2000 already [10, 13]. But only recently research started on joining tele-lecturing with community functionalities. During the workshop *eLectures 2009* at the conference DeLFI 2009 [15] an approach of integrating tele-lecturing applications into facebook [2], a combination of wikis and tele-lecturing [6] and other social e-learning approaches were shown. One main question that was not addressed yet and where recent projects haven't used a common approach is whether tele-lecturing content should be integrated into communities or social networks or the main social and community features should rather be incorporated into tele-teaching platforms. Both approaches will be pondered in the next paragraph.

2.2 How to Combine Tele-Lecturing Content with Communities

All online communities have one main purpose to them. Either they aim to connect people that know each other in a private context or to link people that have some kind of business connection. Most of the functionalities included in these portals are adapted to the main focus of these communities. On that account the users also enter the portals with a certain attitude and expectancy. To include tele-teaching content in these communities would therefore be inefficient as the users will not expect e-learning content in those portals and would not be as motivated to engage into learning. Also Christian Dalsgaard is arguing in his journal article that it will be necessary to develop educational social software tools that enhance the learning by offering collaboration tools where students can interact with each other concerning a specific learning context. He is furthermore stating that social and community functionalities should not be mixed with Learning Management Systems, but rather separate tools should be offered to the students for different learning tasks [4]. Tele-lectures can be one specific learning context this approach can be applied to. For that reason the better approach is the extension of tele-teaching communities by integrating community functionalities. These functionalities can lead to an improved usability and include a fun factor known from the private live into the tele-teaching scenario. The success of social networks and communities have been proof of concept for community and social web functionalities in this context. But there has not been any experience if these features can successfully be utilized in tele-teaching scenarios. Therefore potential benefits will be explained in the next paragraph.

[7] http://www.wikipedia.org/
[8] http://www.myspace.com/
[9] http://www.youtube.com/
[10] http://www.flickr.com/

2.3 Utility of Rating in Tele-Teaching Portals

One of the main functionalities that need to be provided in tele-teaching portals is a good structuring and search functionality for facilitating the access to content the users are really looking for [15]. Usually search amongst and structuring of content is realized by utilizing the metadata provided with the content. This metadata can be inserted manually or harvested automatically by analysing the e-lectures' video and audio channels [12]. A way to improve the data that can be used for structuring the content and searching amongst content items is the utilization of user-generated data. These data include for example tags, annotations, comments and also ratings. User-generated data is independent from the content generators, the institutions and tele-teaching content providers that publish e-lectures. It therefore provides a different point of view on the data. Rating is the user-generated enhancement to standard metadata that is easiest for the users. It is usually a small set of integers where the user chooses one of the values. The evaluation of content in this manner is therefore an easy and quick process for the user which he might be more willing to go through than a more time intense process like writing comments or annotations. Facilitating the engagement of users is an important issue in this context as the user participation is usually not very high as a study about the web 2.0 video service YouTube [3] showed. Is the rating implemented and accepted by the users it will facilitate the search in the content as the search results can be ranked according to the ratings. The same method can be used for recommendation systems. If several e-lectures are available as related content to be shown in the recommendations list for a tele-teaching item, the ratings could again be used as ranking to select the most positively rated items for each related topic.

3 Applying Rating to the Tele-Lecturing Context

As it was motivated that rating can improve the usability of tele-teaching portals, the adoption of the rating functionality to a tele-teaching portal will be explained now. The questions that need to be addressed in this context are:

1. What can be rated and is there anything where rating shouldn't be enabled?
2. How is the rating calculated?
3. Where will the rating be shown?

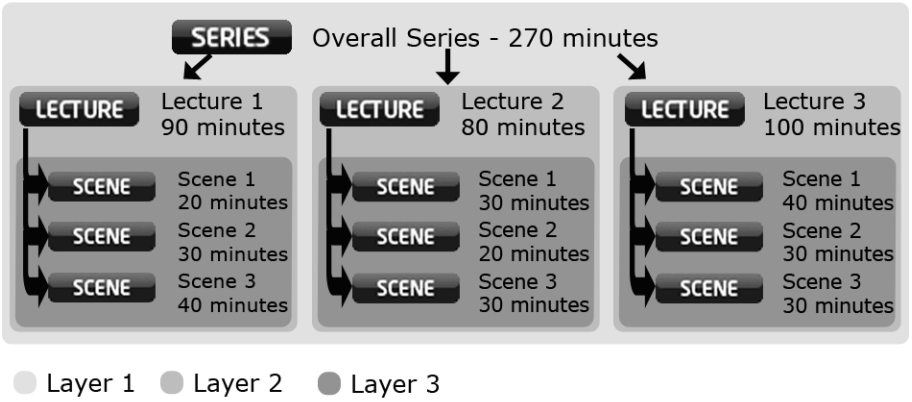

Figure 1: Several content layers in tele-lecturing portals

4. Where can the rating be utilized?

5. Are there any constraints when using rating?

The next paragraphs will address these issues.

3.1 Rating Over Several Layers

In the tele-teaching context there are several layers where rating can be applied as visualized in figure 1. Usually such a portal consists of lecture recordings that are held by lecturers. The lectures itself are mostly embedded in a larger context, for example the course which runs a whole semester. Furthermore the lectures are often subdivided into smaller pieces. This is done in order to facilitate the usage of mobile players where the content needs to be downloaded, for podcasting and also to simplify a more precise metadata collection and search [5]. As all the three layers include tele-teaching content, all of them should be rateable individually.

But as a certain rating leaves an implication on the perceived quality, a rating of people should not be enabled, because solely the tele-teaching content and not the personal impression of the lecturer are important for a reliable and useful rating result. Unfair comments on people can therewith be avoided. Another constraint needs to be considered. Some people might still vote badly for learning videos without actually viewing them just because they dislike the lecturer or vote too positive because they favour the lecturer. Therefore one should either enable voting only if the lecture was viewed in fact or, if measuring this is not possible, a time constraint between votes should be implemented. As the voting across several layers is used, a way of reliably calculating a result that reflects the ratings across the different layers needs to be thought of. The following paragraph will address this issue.

3.2 Calculating the Ratings

There are several defined ways of calculating average values. This paragraph evaluates the advantages and problems of the different average calculation methods in the context of average calculation over several layers.

3.2.1 Arithmetic Mean

Arithmetic mean from n values $a_1, a_2, ..., a_n$ is the expression

$$x_a = \frac{1}{n}\sum_{k=1}^{n} a_k$$

The arithmetic mean is the most common type of mean. It is generally no robust way of calculating statistics, because extreme deviant values might distort the outcome.

3.2.2 Geometric mean

The geometric mean is similar to the arithmetic mean, but interprets the given values according to product and not their sum.

$$x_a = \left(\prod_{k=1}^{n} a_k\right)^{\frac{1}{n}}$$

An example usage is to calculate the rates of growth.

3.2.3 Harmonic mean

The harmonic mean is defined as follows:

$$x_a = \left[\frac{1}{n}\sum_{k=1}^{n} \frac{1}{a_k}\right]^{-1}$$

It is used to calculate a mean value of factors that are defined by a relative reference to another unit, like for example velocity (distance per time). A common task solved with the harmonic mean is the calculation of a mean of several velocities over a certain distance.

3.2.4 Median

The median number is always part of the set of values given for the calculation. It is the value you receive if you order all values of the given set and extract the central value. This method is especially useful, if extreme deviant values are expected to be in the set as these may distort the result.

3.2.5 Truncated mean

If extreme deviant values are expected in a statistical evaluation, it is possible to truncate these by sorting all values and cutting off a certain percentage of values from the beginning and from the end.

3.2.6 Weighted mean

When several values together are taken to calculate a mean value, these values might not be equally important for the final result. If this is the case a weighting factor which determines the share of the single value at the result might be introduced into the equation. The following equation shows the weighting of different values in a calculation of an arithmetic mean:

$$x_a = \frac{1}{\sum_{k=1}^{n} w_k} \sum_{k=1}^{n} w_k a_k$$

w_k= weighting factor of the k^{th} element
a = arithmetic mean

3.2.7 Combining the Arithmetic and the Weighted Mean

As rating uses a pre-set interval of values that the user can choose and which are used to calculate the mean afterwards, deviant values need not be considered and average calculations like median or truncated mean need not be used to ensure a valid result. As the rating is furthermore not a mean value that is calculated with a factor that includes a relative reference to another unit and no changing rate is required, the arithmetic mean is the mean calculation of choice for ratings. Because the rating shall be calculated across several layers a weighting of the subset ratings is required. The weighted mean (WM) rating of a content item will be calculated by combining and weighting the means (M) of all ratings for the content item and the ratings for its connected content items of the layers underneath and above.

Equation (1) shows how the arithmetic mean of all ratings for one content item is calculated. This equation is the basis for all further calculations of the mean rating that consider a weighting.

$$M_{CSin} = \frac{\sum_{i=1}^{p} R_p}{p} \tag{1}$$

The calculation of the weighted mean for one layer of connected content items (for example all segments that belong to one lecture or all lectures that belong to one series as explained in section 3.1) is shown in equation (2). The factor for weighting the different arithmetic means that were calculated in (1) is the length of the content items. One example: a lecture which is 30 minutes long consists of 3 segments, the first is 5, the second 10 and the third 15 minutes long. The mean rating for the longest segment should have most influence on the weighted mean calculation for the lecture and the other two have lower priority. Equation (2) calculates the combined mean of one layer of content items (as for example the before mentioned three segments) by weighting the means of the single segments with their length.

$$WM_{CLay} = \frac{\sum_{i=1}^{n} L_{CSin_i} \cdot M_{CSin_i}}{\sum_{i=1}^{n} L_{CSin_i}} \tag{2}$$

The overall calculation of the weighted mean for one content item considering all connected layers underneath and on top is shown in equation (3). It follows the same principles as equation (2), but it uses the means of all layers that were calculated with equation (2) and combines them to a weighted mean. The factor for weighting is also a different one now. As one content item has the same length as the sum of all connected items in the layer underneath, the length is no proper weighting factor in this case. The number of ratings is the factor that determines which mean ratings have which prioritization. But as all the segments (which are used for podcasting) together will most certainly receive more ratings than the single lecture they belong to, the ratio of prioritizing only by number of ratings would minimize the effect of the mean rating of the single content item. Therefore the ratio of the number of ratings to the number of content items of the layer is used as weighting factor to combine the means of the different layers.

$$WM_{CSin} = \frac{\sum_{i=1}^{m} \frac{NoR_{CLay_i}}{NoC_{CLay_i}} \cdot WM_{CLay_i}}{\sum_{i=1}^{m} \frac{NoR_{CLay_i}}{NoC_{CLay_i}}} \quad (3)$$

CSin = Single content item
CLay = All content items in one layer
p = Number of ratings per content item
n = Number of content items per layer
m = Number of layers
R = Rating
L = Length of the content item
M = Arithmetic mean of all ratings for one content item
WM = Weighted mean
NoR = Number of ratings
NoC = Number of content items in this layer

3.3 Displaying and Managing the Ratings

There are several places where the ratings can be used to enhance the user interface. The result of the rating should be shown in all places where the content items that can be rated are previewed. This is necessary to ensure easy access and visibility of the functionality for the users. The possiblity to rate should also be given on as many pages related to the content item as possible (like the lecture details page, the video display page). This is inevitable because only easily accessible and usable functionalities will be used frequently and only the intensive usage of the rating feature will ensure a reliable result.

Because a rating may influence the further interaction of the users with the rated content item, it should be ensured that the ratings displayed are as valid as possible. This can firstly be ensured by using a proper calculation method as explained and secondly by constricting the display.

A rating result should only be displayed when a certain number of people have already rated to assure that one or two persons do not have the a major influence on the further impression of the content item. In the case of the tele-TASK portal it was decided to set the minimum number of votes to three, until the voting functionality has become more popular and voting results will be displayed more quickly. A higher number would ensure more valid results.

For the users to supervise their actions in the community area of the portal, an interface for managing ones own votes is required. Deleting and altering of votes should be allowed here.

A major application of votes is in the search area. The usual search approach via keywords can be enhanced by including rating. In order to further confine the search results, the rates can be utilized in a sort function to prioritize the search hits according to the given rates. A similar approach can be used when showing recommendations. These referrals can be shown on the series or lecture layer. They include a visual list of series or lectures that have a correlation in terms of their content. If too many recommendations are found these might as well be prioritized with the help of ratings. In this way more relevant hits can be shown.

3.4 Evaluation of the Rating Functionality

As was already mentioned in the study about YouTube [3], only a small number of users are willing to participate in social web and community activities. With the implementation of the rating functionality for the learners community in the tele-teaching portal tele-TASK the same issue can be observed. Being online for about two month now, only a very small number of users has used the rating function so far. The usage of the portal in general is quite high with 7.500 users per month.

4 Conclusions and Future Work

The utility of a rating functionality in the tele-lecturing context was motivated in this paper and an implementation proposed. Although this functionality is known for the users from the often privately used web 2.0 video portals Google videos[11] and YouTube, the acceptance of the functionality in the learning context was not very good so far. The reason for this could be that the users do not want to spend time with community features while engaging into the learning process or they might consider the effort too much for the benefit. A user questionnaire should be raised in order to gain insight into the users' perception of these features. Furthermore a usability test with the think aloud method [9] would give hints on how to improve the usability of the feature to facilitate the utilization for the users.

Quite often the same video contents are shared and exchanged between different portals. The videos from the tele-TASK-archive are for example distributed via the tele-TASK portal, via iTunes U, via RSS export and the videos are also shared with the video search engine Yovisto [5]. As the user participation is often a problem in video portals another option can be to exchange user-generated data as well. A special RSS parameter could for example serve for the purpose of exporting a rating with all distributed videos.

When the rating is properly adopted, several other applications next to displaying the rating results for the users, filtering the search according to the rating results and using the rating in recommendation systems can be thought of. Rating can be used in order to build up a

[11] http://video.google.com/

self-controlling community. User-generated tags and annotations can be judged by users again by enabling rating for these features as well.

Community features in tele-teaching environments have high potentials. They help enlarging the metadata base for the content in these systems and with the help of the metadata users might more easily find specific content and the content may be submitted to a larger context via semantic web technologies.

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