Using Social Navigation for Multimedia Content Suggestion

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***Abstract*-This work presents a web lecture systems that allows its users to visualize and re-use aggregated actions taken from user's past interaction for enhanced content navigation and multimedia retrieval.**

I. Introduction

Social navigation is an emerging trend for enhancing online learning material such as hypertext. With social navigation, users can be guided through collections of learning material by following other users' traces. This allows users to easily identify which material attracted more other users and kept their attention. In contrast to page based hypertext content it is even more complicated taking the time based multimedia objects' nature into account where the important information might be hidden in time. Knowing upfront what content is contained within a multimedia object can go a long way toward connecting the user with the information they are seeking. This paper presents an implementation of a multimedia web lecture interface that allows its users to visualize and re-use aggregated actions taken from other users past interaction for enhanced navigation and multimedia retrieval.

This usage information is collected and evaluated by a backend system and is then be used for multimedia suggestion in other web lectures.

II. Terms and Definition

A. Social navigation on the web

Social navigation [2] is a specific kind of social information access, a stream of research that explores methods for organizing users' past interaction with an information system (known as explicit and implicit feedback), in order to provide better access to information to the future users of the system [1]. Social navigation in its early forms attempted to visualize the aggregated or individual actions of community users. The motivation behind this work was that that these "footprints" can help community users to navigate through information space.

B. Web lectures and the problem of indexing time based media

Web based multimedia video content is being used in education, entertainment as well as in commerce. Content analysis and multimedia information retrieval plays an important role in content understanding. Being able to detect who or what was shown or explained in a picture, video or audio file is useful for understanding the semantics of media content. If this kind of material does not have any form of meta-annotation it is nearly impossible for users to retrieve information. The context in which media is being used (and what it literally represents) plays an important role in understanding and later content reuse. The problem of contextual indexing time based media in a way that satisfies users and helps them to easily locate information exactly for their needs has been tackled by different approaches. They can be divided into a group that uses technical (computer vision algorithms, semantic) solutions for analyzing the content and attempts that aim at involving users by utilizing usage meta-data. Lecture recordings typically inhere a lot of additional information. For example the contextual information is available due to additional material like presentation slides, the community consists of students, the content level is based on the knowledge of the students. Examining community usage of text in order to better organize and index documents has been shown by many examples. Page Rank applied this idea to textual web [3]. The communicative context (in this case hyperlinks) is used in order to try to understand and evaluate the significance or importance instead of trying to understand the content itself. Due to the complexity of time based media it is important to understand how specific communities are actually using media.

Related work in this field can be found in work presented by [4] where contextual information and media relationship have been utilizes for chaptering and indexing video content. Further work and additional ideas can be found in [5].

III. Social Footprints in virtPresenter

While a user watches a recorded web lecture (video plus a synchronized content stream), the virtPresenter content player sends periodically a feedback to the backend system containing information about what part of the lecture has been watched by the user since the last feedback. When a user navigates to another point of time inside of the recorded lecture using the video scrubber, the feedback is sent immediately and the feedback accumulation is reset at the new position. Figure 1 shows the virtPresenter web lecture interface displaying user-generated footprints in the video scrubber. Footprints are highlighted by different color intensities describing the amount of footprints in a certain position of the video.

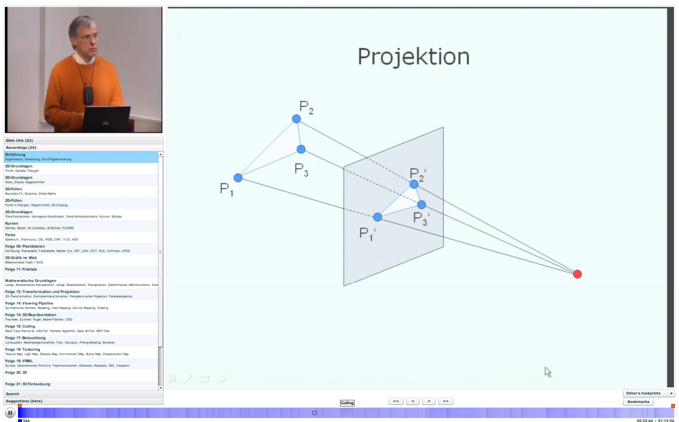

Figure 1: virtPresenter web interface displaying footprints

IV. Multimedia Suggestion Based on User Action

Single footprints are classified by the associated context data. Furthermore footprints can be classified according to the position inside of a lecture and the session it belongs to. This classification results from a context-based analysis that considers footprints in the set of footprints of the same user session. The first step of multimedia suggestion is to generate a set of segments that serve as a pool of potential suggest items. Suggest items should be coherent with respect to the content. Most lectures contain slides that resemble a very good segmentation. Unfortunately the number of slides is usually very small and the common lecture of 90 minutes contains 5 to 20 slides. The actual sections of certain correlations are often much shorter and cannot be mapped to a slide. This paper pursues the approach of dividing the timeline into a fixed number of 100 segments of equal size. This corresponds to a segment length of 54 seconds in a lecture of 90 minutes. Subsequently the segments will be associated with the entry footprints that have been captured in a respective time frame.

Considering the set of footprints of a session as a sequence of n footprints ordered by creation time, there are successor footprints for n-1. To find the successor segment for a footprint, every segment is associated with the segment of the successor footprint. This is achieved by running a transaction to find the successor footprint for every footprint of a session. Finally every footprint will be associated with the segment it belongs to by comparing the entry points of both footprints with the start and end point of all segments. Figure 2 shows the web lecture interface displaying the segments with the highlighted entry footprints on the timeline and the appropriate multimedia content suggestion below the presenter video.

Figure 2: Visualized multimedia content suggestion based on user interaction

While the video is playing the content player calls periodically the backend system to retrieve the latest list of suggestions for the current position in the web lecture. The suggest items are displayed beneath the presenter video sorted by relevance in a list view showing the slide title and the relevance value.

V. Pitfalls and Possibilities

Instead of dividing the timeline into 100 segments of equal length, multimedia suggestion could be enhanced by taking segments of variable length into account. The set of segments could be generated from the users' footprints and be the starting point for the method described in the last section. Considering the footprints of a lecture as a function and calculating the inflection points could be one way to achieve this. Those points could then mark the beginning of the next segment. This approach would make the suggestions more accurate.

References

[1] P. Brusilovsky, "Social Information Access: The Other Side of the Social Web," In: V. Geffert, et al. (eds.) Proceedings of SOFSEM 2008, 34th International Conference on Current Trends in Theory and Practice of Computer Science, High Tatras, Slovakia, January 19-25, 2008, Springer Verlag, pp. 5-22.

[2] A. Dieberger, "Supporting social navigation on the World Wide Web," International Journal of Human-Computer Interaction 46,1997, pp. 805-825.

[3] L. Page, S. Brin, R. Motwani, and T. Winograd, "The pagerank citation ranking: Bringing order to the web," Technical Report, Stanford InfoLab, 1999.

[4] D. A. Shamma, R. Shaw, P. L. Shafton and Y. Liu, "Watch what I watch: using community activity to understand content," In Proceedings of the international workshop on Workshop on multimedia information retrieval (MIR '07). ACM, New York, NY, USA, 2007, pp. 275-284.

[5] Ketterl, M., Mertens, R., Vornberger, O., "Bringing web 2.0 to web lectures," International Journal of Interactive Technology and Smart Education (ITSE); 6(2), Emerald Group Publishing Limited, 2009, pp. 82-96.