Supporting Moodle-Based Lesson through Visual Analysis

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Abstract. The effective use of CMS requires that instructors can be provided with appropriate means of diagnosing problems. The aim of this research is to support the comprehension of the semantics content evolution within eLearning environments through uncovering by means of visual representations. Therefore, we have carried out the meaning of an eLearning database and represented the more relevant results by depicting them using a visualization based on the tag cloud visual representation. Additionally, we have validated our proposal through a case study.

Keywords: Visualization, e-learning, timeline, tag cloud, Moodle.

1   Introduction

The Moodle is a free license, open-source software platform. The core system of Moodle is structured in modules, each of them providing a wide set of functions. Each module has a connection and access policy based on roles. Also Learning Management System (LMS), or Virtual Learning Environment (VLE) has the same structure. According to [1], Visual Analytics supports analytical reasoning through interactive visual interfaces. This area has an important limitation towards its implementation within the LMS. Using Web Services (WS) in Moodle gives more control in the connecting operation obtaining the optimal service. This API is the base to develop a set of WS: Moodle-DFWSs. This article will use the Moodle web services layer [2] as a proxy to retrieval and exchange information. As the associated data source changes over time, tag clouds can evolve. However, while the tagcloud seems to exposure their evolution over time, they do not explicitly represent them. We organize this paper as follows: in the next section we outline the related work to provide context for our description of Temporal Tagclouds and then the case study, which follows in Section 3. Finally, the contributions and future work.

2   Related work

A tagcloud usually has the purpose to present a visual overview of a text collection. In the work presented by Torniai et al. the tag cloud employs the size and colour of tags to offer teachers information describing the tags popularity and relevancy[3]. Tree Cloud arranges words on a tree to reflect their semantic proximity according to the

text [4]. Despite the significant amount of research on tag clouds, few has been done on how to visualize trends in tag clouds. Parallel Tag Clouds (PTCs) is designed to provide an overview of a document collection by incorporating graphical elements of parallel coordinates with the text size encoding of traditional tag clouds [5]. While PTCs do show multiple clouds simultaneously, they do not explicitly represent trends, and thus comparing multiple tag clouds to ascertain trends places the cognitive demands on the person. Bongshin, et al. integrate sparklines into a tag cloud to convey trends between multiple tag clouds. Also they make controlled study to explore the efficacy of temporal representation on tag cloud, see SparkClouds [6]. The first attempt to use the tag cloud view as a part of the coordinated multiple views (CMV) system was presented by Matkovic, et al. [7].

3   Description of Temporal tagcloud and case study

The main goal of the visualization is to provide a compact representation of the forums' interaction on VLE overall use, and its evolution over the time. Usually, a tagcloud presents a certain number of most often used tags in a defined area of the user interface. A tag's popularity is expressed by its font size (relative to the other tags). Next to their visualization function, tagclouds are also navigation interfaces as the tags are usually hyperlinks leading to a collection of items they are associated with. Furthermore, several layout variations emerged on the basic design principles of tag clouds. Also the representativeness evolution of each tag over the time is one of the goals of the representation. Fig. 1 up provides an overview of a tag with its three main components: the bar-graph, wave-graph representation and the tag. The bar-graph and wave-graph representation curves, shown in the Fig. 1, shows the significance of document content, represented by a word, over time. The size of the words font represents the meaningful of the word on forum activity of the VLE.


Fig. 1. On up,the representation of a single tag on Temporal tagcloud, on down, "view of tag problema".

To further improve readability of the curves and bars meaning, they are assigned with different colours depending on their activity, green for update-post, red for read-post, and blue for add-post. The x-axis encodes the time and the y-axis encodes the significance of the word clouds. Later, this view can be adapted to the user's requirements, so it can explore all the available discussions, forums, courses and users data, going from overview to detail of a given person, course or discussion within a period of time. Here the user can chose, through the contextual menu interaction (see

Fig. 2 right), to view among the keywords: the users, the courses, the discussions and the subjects of the forum posts and the obtained from the analysis of all the semantic content of all forum posts exchanged in the platform. One of the interested visual analytic technique used on this work is the semantic zoom [9]. The user can draw or hide every element of the representation on the visualization (notice the difference between Fig. 2 left and Fig. 2 right).

This paper is based upon the study of "view, update and post" statistics obtained through the real time "Reports" from the logs of the Software Engineering course, during the academic year 2008-2009 and 2009-2010, we are considering 88100 log entries. In both courses the subject has been developed in the first semester of the academic year (September to February) and had an average of about 160 students. Regarding the forum analysis, we are going to consider 51 forums, with 114 discussion threads, 172 posts and 26979 forum accesses.
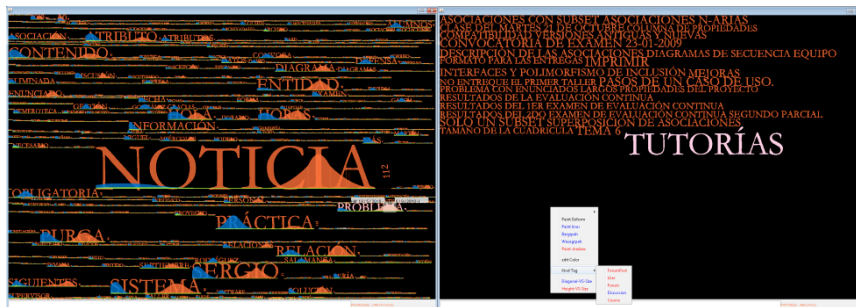
Fig. 2. On left, Global view of temporal tagcloud of forum posts. On right, Global view of temporal tagcloud of discussions

Using that information we intend to conduct a study which should determine the behaviour of the activity in platform. The result of the application of Temporal Tagcloud is shown in Figure 2 left.

Monitoring a specific theme, forum, discussion or course: the user tries to maintain the track of all discussions, forums and posts that they make, as a normally conversation or discussion. In the Figure 2 left, we could see in a bigger size the most used words . From this figure we could infer that the forum is used to inform students about events related to the subject. Also here must be considered some issues of the workshop statement, such as: Id, Gestión, Sistema, sistema de Purga, etc. Furthermore, the forum is used to answer questions related to different areas of the subject. Also, the users need to review, update and to monitor the most frequent discussions, posts, specific problem or student. Theoretically, the increase should be focused on the months of October and November and may be included a part of December. In Fig. 2 left and Fig. 1 down can be seen that each tagcloud can show (see the "problema" tagcloud) the specific period of time on wave-graph through a mouse move interaction. Therefore, it shows that periods of increased activity in the commented courses correspond to the months of classroom teaching, with particularly representative peaks around the dates of the workshops. In Fig. 1 up, we could observe this phenomenon with the word ¨practice¨. Taking into consideration adding posts (in blue) we could see that the information of the Practice is added at the

beginning of the course. Considering update posts (in green) we can see that there are very few updates in Practice information. Regarding the read-post, given its rightward shift of the word, symbolizes that first appears midway through the course and stands towards the end, having a greater frequency near the end of teaching period. The user can select a specific period of the time, through Ctrl+ double click over the period that she/he wants (showed in fig. 1 down).

4   Contributions and conclusions

Based on our research, this work is one of the first to generate a visualization that uses tag clouds to depict evolving text content over time. As a result, our work offers unique contributions: **The possibility to use some tasks of the tagcloud**: search, browsing, impression formation or gisting, recognition/matching, Understanding evolution of the tag. **Time-based tag cloud layout** that balances semantic coherence of content and spatial stability of the visualization, helping users to perceive easily content updates. Additionally, future improvement could be including new features, like synonyms and plurals binding (with the use of ontology).

5   References

1. Thomas, J.J., Cook, K.A.: The Science of Analytical Reasoning. Illuminating the Path: The Research and Development Agenda for Visual Analytics, pp. 32-68. National Visualization and Analytics Ctr (2005)
2. Conde González, M.Á., García Peñalvo, F.J., Casany Guerrero, M.J., Alier Forment, M.: Adapting LMS architecture to the SOA an Architectural Approach. In: M. Perry, H.S., M. Ehmann, G. Ortiz Bellot, O. Dini (Eds.) (ed.) Internet and Web Applications and Services ICIW 2009, pp. 322-327. Los Alamitos, California, USA: IEEE Computer Society, Venice/Mestre, Italy (2009)
3. Torniai, C., Jovanovic, J., Gasevic, D., Bateman, S., Hatala, M.: E-Learning meets the Social Semantic Web. In: Conference E-Learning meets the Social Semantic Web, pp. 389-393. (Year)
4. Gambette, P., Véronis, J.: Visualising a Text with a Tree Cloud. In: Locarek-Junge, H., Weihs, C. (eds.) Classification as a Tool for Research, pp. 561-569. Springer Berlin Heidelberg (2010)
5. Collins, C., Viegas, F.B., Wattenberg, M.: Parallel Tag Clouds to explore and analyze faceted text corpora. In: Conference Parallel Tag Clouds to explore and analyze faceted text corpora, pp. 91-98. (Year)
6. Bongshin, L., Riche, N.H., Karlson, A.K., Carpendale, S.: SparkClouds: Visualizing Trends in Tag Clouds. Visualization and Computer Graphics, IEEE Transactions on 16, 1182-1189 (2010)
7. Matkovic, K., Ammer, A., Gracanin, D., Purgathofer, W., Lez, A.: Event Line View: Interactive Visual Analysis of Irregular Time-dependent Data. In: Conference Event Line View: Interactive Visual Analysis of Irregular Time-dependent Data. Springer, (Year)
8. Weiwei, C., Yingcai, W., Shixia, L., Furu, W., Zhou, M.X., Huamin, Q.: Context preserving dynamic word cloud visualization. In: Conference Context preserving dynamic word cloud visualization, pp. 121-128. (Year)
9. Modjeska, D.: Navigation in Electronic Worlds: Research Review for Depth Oral Exam David Modjeska Department of Computer Science. (1997)