Using Video Visualizations in Open edX to Understand Learning Interactions of Students

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Abstract. The emergence of Massive Open Online Courses (MOOCs) has caused a high disrupting effect on online education. One of the most extended MOOC platforms is Open edX. There is a demanding necessity by the instructors and students of these courses to provide timely analytics tools that can help understand the learning process at any moment. In this direction we have developed the Add-on of learNing AnaLYtics Support for open Edx (ANALYSE), which is our learning analytics contribution for Open edX. In this demonstration paper we will provide guidelines on how to use some of the ANALYSE video visualizations in order to detect problems in video resources, so that the learning process can be improved.

Keywords: Moocs · Open edx · Learning analytics · Visualizations

1 Introduction

MOOCs have had quite an important impact on education in the last years. These courses usually have thousands of students, which makes them particularly difficult to control and have a feeling about what is actually happening. Learning analytics functionality is a key factor in these virtual environments for allowing students self-reflection and facilitating teachers to make decisions based on data. However, most of the MOOC platforms are not providing yet the learning analytics functionalities to support these courses. Therefore, as an example, instructors might feel a little bit lost about how their students are progressing in the course or whether some learning resources are causing problems due to a bad design. The use of visualizations with the objective of transmitting information is a common tool in learning analytics. We can find several learning analytics developments for different platforms such as ALAS-KA [1] for Khan Academy which also include visualizations for video activity.

Currently our efforts are focused on Open edX platform. Most of the MOOC data analyses in the literature are performed over the static data after course completion. As

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an example we can find several post-hoc analysis papers[1] by the MIT Office of Digital Learning. However, there is not much work developed in Open edX aimed at providing timely information for both students and instructors while taking and teaching a course respectively. The current support for learning analytics in Open edX is at an early stage providing a single visualization about the progress in problems. In this direction we have developed ANALYSE, which currently incorporates 12 brand new visualizations that were not present previously in Open edX. In this paper we provide guidelines on how to use some of the video visualizations included in ANALYSE to detect problems in educational video resources.

2 Detecting Problems in Video Resources with Visualizations

Information regarding the use of videos is often not provided by MOOC platforms, an exception can be Khan Academy[2] which provides several visualizations regarding video activity for students and instructors. In this section we use three of the visualizations provided by ANALYSE to study how these charts can be interpreted in order to obtain further insight about problems in video resources. In MOOCs such as the ones delivered in edX, video resources are one of the most used components by students, as reported initial research on this matter [2]. Therefore we want to point out the importance of providing tools that support such type of analysis, for example to find out which designs are better in order to improve the effectiveness of video resources. The data of these examples have been prepared for the sole purpose of creating a case study for this scientific contribution.

Figure 1 shows in dark blue the *Different Video Time* in each video (from 0 to 100) and in light blue *Total Video Time* (from 0 to infinite). The difference between these two values is that the *Different Video Time* can be seen as the percentage of progress in a video whereas the *Total Video Time* can contain parts that have been reproduced repetitively by the students. Therefore if the difference between these two values is very high, it might indicate that there are problems in that video because students are repeating the video more than once. Analyzing Fig. 1 we can detect two videos where the difference between the two values is very high, which are "Correlations" and "Algorithms" and we want to look more in depth. Figure 2 shows for these two videos the *Repetition of Video Intervals* visualization, where we can see the number of times that each second of a video has been reproduced and Fig. 3 shows the *Distribution of Video Events* visualization where it is represented the second in which each video event was triggered.

Figure 2 shows for each one of these two videos the *Repetition of Video Intervals* visualization, where we can see the number of times that each video second has been reproduced. Additionally, the second in which each video event was triggered is represented by the *Distribution of Video Events* visualization shown in Fig. 3. We analyze first the video "Correlations". We can see in Fig. 2 that there is an approximate interval from second 15 to 70 that has been reproduced many more times than the rest of the

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[1] http://odl.mit.edu/mitx-working-papers. (visited on 07/01/2015).
[2] https://www.khanacademy.org (visited on 07/01/2015).

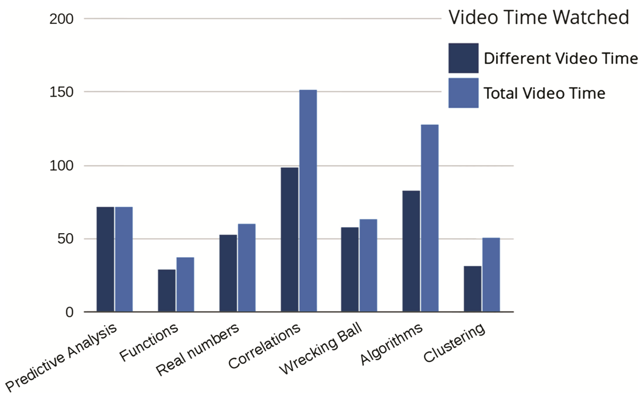

Fig. 1. *Video Time Watched* visualization by all the students in the course

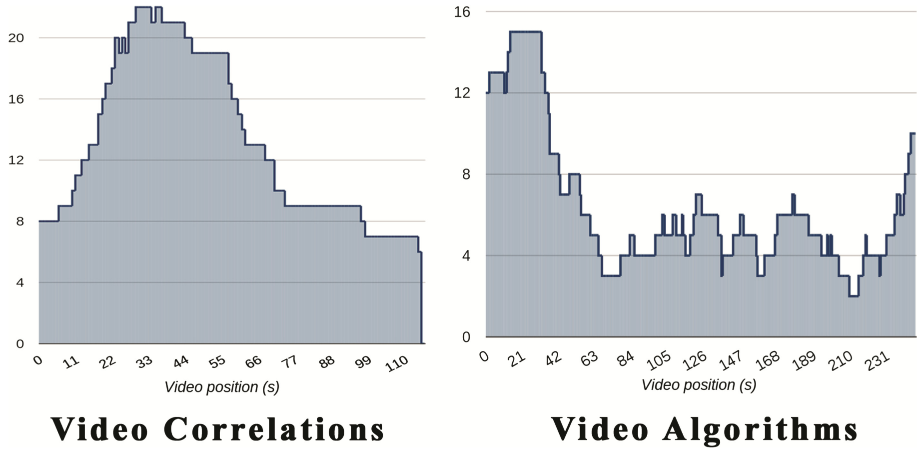

Fig. 2. *Repetition of Video Intervals* comparison between the two videos

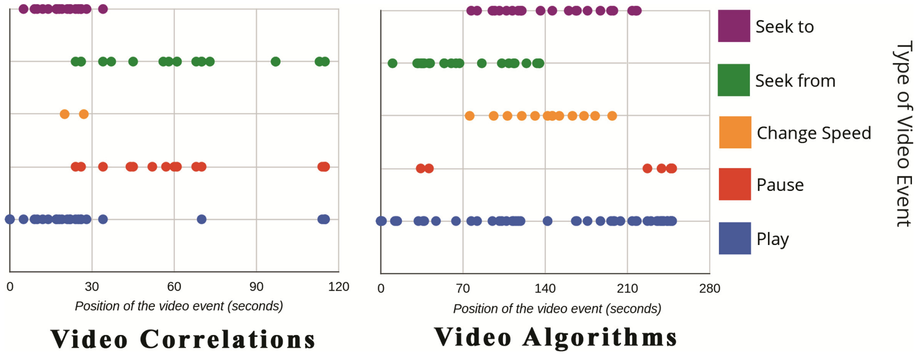

Fig. 3. *Distribution of Video Events* in the two problematic videos

video. In addition, if we inspect Fig. 3 we can check that there are many "seek to" events approximately in the start of that time interval (around second 15). A possible interpretation of these results could be that the video interval might be very hard to understand for the students and they are seeking to the start of the interval to watch it repetitively.

In the case of the video "Algorithms", Fig. 2 shows that students start watching the video a lot, but then it gradually drops out to a much lower level of reproduction times after second 60. The additional information provided by Fig. 3 shows that the video "Algorithms" have many "seek from" events around second 70 to a later time, as we can also find many "seek to" events around second 140. Therefore, a possible explanation for these results is that the video has a normal start but around second 60 some kind of problem is arising in the video and that is causing students to seek to a later time of the video; maybe this part of the video is not an important one, and that might be the reason why students are forwarding time. Previous works have also analyzed the possible meanings of peaks in the number of views in certain segments of videos with similar conclusions [3].

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References

1. Ruipérez-Valiente, J.A., Muñoz-Merino, P.J., Leony, D., DelgadoKloos, C.: ALAS-KA: A learning analytics extension for better understanding the learning process in the Khan Academy platform. Comput. Hum. Behav. **47**, 139–148 (2015)
2. Seaton, D.T., Bergner, Y., Chuang, I., Mitros, P., Pritchard, D.E.: Who does what in a massive open online course? Commun. ACM **57**, 58–65 (2014)
3. Kim, J., Guo, P.J., Seaton, D.T., Mitros, P., Gajos, K.Z., Miller, R.C.: Understanding in-video dropouts and interaction peaks in online lecture videos. In: Proceedings of the First ACM Conference on Learning @ scale conference, pp. 31–40 (2014)